travel time due to the elimination of congestion points that are present with the highway network for the No-Project and HST Alternatives.

The methodology for estimating the auto travel times for the Modal Alternative uses the Bureau of Public Roads (BPR) *Volume Delay Function* (VDF) curves, and results in an inter-county travel time for the Modal Alternative that is expressed in relation to the travel time for the No-Project Alternative

Key Assumptions

The methodology assumes that the No-Project Alternative, which is estimated to serve 215.54 intercity auto trips in 2020, represents capacity conditions on the intercity highway system. In other words, it is assumed that the volume-to-capacity (V/C) ratio is equal to 1.0 in all HST intercity markets.

The methodology also assumes that the Modal Alternative will serve 217.93 intercity auto trips in 2020, which represents the No-Project demand plus the portion of the "HST induced trips" that was allocated back to the highway mode. (The remaining HST induced trips were allocated back to the aviation mode.) The methodology also assumes that all of the highway improvements described in the *System Alternative Definition* report will provide capacity for the representative intercity demand.

Volume and Capacity

As noted previously, the Modal Alternative has a higher demand for auto travel than the No-Project Alternative. The Modal Alternative has 1.1 percent more trips than the No-Project (or "1.011V" using the previous V and C designations).

The Modal Alternative also has freeway capacity increases across all HST regions for the freeway corridors that serve these trips. The following paragraphs describe these increases and the assumed change in overall intercity travel capacity that these additional lanes represent:

- **Bay Area –** An average, regionwide capacity increase of 25 percent (or "1.25 C" using the previous V and C designations) is assumed on the corridors of most interest for the representative intercity travel demand. The average is derived from the following improvements:

  – U.S. 101 – San Francisco to San Jose, 25 percent capacity increase;

  – U.S. 101 – San Jose to Gilroy, 33 to 50 percent capacity increase;

  – I-80 – Oakland to Sacramento, 25 percent capacity increase;

assumption is fairly standard professional practice in transportation studies, and was also adopted for the HST Alternative in this project.

  - I-880 – Oakland to San Jose, 25 to 33 percent capacity increase;
  - I-580 – Hayward to Central Valley, 25 percent capacity increase; and
  - U.S. 152 – Gilroy to I-5, 50 to 100 percent capacity increase.

- **Central Valley –** An average, regionwide capacity increase of 40 percent (or "1.4 C" using the previous V and C designations) is assumed on the corridors of most interest for the representative intercity travel demand. The average is derived from the following improvements:

  - I-5 – Sacramento to the Grapevine, 33 to 50 percent capacity increase; and
  - SR 99 – Sacramento to I-5, 33 to 50 percent capacity increase.

- **Grapevine and Antelope Valley –** An average, regionwide capacity increase of 40 percent (or "1.4 C" using the previous V and C designations) is assumed on the corridors of most interest for the representative intercity travel demand. The average is derived from the following improvements:

  - I-5 – SR 99 to Downtown Los Angeles, 33 to 50 percent capacity increase; and
  - SR 14 – Palmdale to I-5, 50 percent capacity increase.

- **Southern California –** An average, regionwide capacity increase of 25 percent (or "1.25 C" using the previous V and C designations) is assumed on the corridors of most interest for the representative intercity travel demand. The average is derived from the following improvements:

  - I-5 – Downtown Los Angeles to Anaheim, 33 to 50 percent capacity increase;
  - I-5 – Anaheim to San Diego, 20 to 25 percent capacity increase;
  - I-10 – Downtown Los Angeles to San Bernardino, 20 to 25 percent capacity increase;
  - I-15 – Ontario to Miramar, 20 to 25 percent capacity increase;
  - I-215 – San Bernardino to Temecula, 33 to 50 percent capacity increase; and
  - I-8/SR 163 – Miramar to I-5, 25 percent capacity increase.

- **Travel Time Derivation –** For the No-Project Alternative, it was assumed that the V/C ratio is equal to 1.0 (volume equals capacity). Therefore, applying the BPR equation results in:

  $Time(NB) = T(FF) * (1 + 0.15 * (Volume / Capacity)\text{^}4)$ (Note: This is the standard BPR equation.)

  $Time(NB) = T(FF) * (1 + 0.15 * (V / C)\text{^}4)$

  $Time(NB) = T(FF) * (1 + 0.15 * (1)\text{^}4)$

  $Time(NB) = 1.15 * T(FF)$

Where:

Time(NB) = travel time via auto for the No-Project Alternative.

Time(FF) = free-flow travel time via auto.

V = representative intercity trips by auto for the No-Project Alternative.

C = representative auto capacity for intercity trips for the No-Project Alternative.

For the Modal Alternative, the volume and capacity changes noted in the previous sections get applied to the same BPR equation, resulting in:

Bay Area and Southern California

$$Time(M) = T(FF) * \left(1 + 0.15 * \left(Volume / Capacity\right)\text{^}4\right)$$

$$Time(M) = T(FF) * \left(1 + 0.15 * \left(1.011V / 1.25C\right)\text{^}4\right)$$

$$Time(M) = T(FF) * \left(1 + 0.15 * \left(.4279\right)\right)$$ (Note: V and C cancel each other out.)

$$Time(M) = 1.064 * T(FF)$$

$$Time(M) = 1.064 * \left(T(NB) / 1.15\right)$$ (Note: Substitute from above set of equations.)

$$Time(M) = 0.925 * T(NB)$$

Where:

Time(M) = travel time via auto for the Modal Alternative.

Central Valley and Grapevine

$$Time(M) = T(FF) * \left(1 + 0.15 * \left(Volume / Capacity\right)\text{^}4\right)$$

$$Time(M) = T(FF) * \left(1 + 0.15 * \left(1.011V / 1.4C\right)\text{^}4\right)$$

$$Time(M) = T(FF) * \left(1 + 0.15 * \left(.2720\right)\right)$$ (Note: V and C cancel each other out.)

$$Time(M) = 1.040 * T(FF)$$

$$Time(M) = 1.040 * \left(T(NB) / 1.15\right)$$ (Note: substitute from above set of equations.)

$$Time(M) = 0.905 * T(NB)$$

Where:

Time(M) = travel time via auto for the Modal Alternative.

Time(FF), V, and C = same as above.

This methodology resulted in a 7.5 percent travel time reduction for auto trips in the Bay Area and Southern California, and a 9.5 percent travel reduction for auto trips in the Central Valley for the Modal Alternative. Auto trips that pass between regions would be assumed to experience an 8.5 percent travel time reduction (average of the two values).

These values for the Modal Alternative are expressed as a reduction from the corresponding travel times in the No-Project Alternative. As noted in the main report, for purposes of the growth effects analysis, the No-Project Alternative was assumed to follow the Business Plan auto travel time assumptions from Sensitivity Test 3, which involved a travel time increase of 30 minutes for auto trips to, from, or through the Los Angeles and Bay Area regions.

Appendix B

Transportation Demand and Levels of Service for the Irvine Design Option

Appendix B. Transportation Demand and Levels of Service for the Irvine Design Option

The analysis of economic growth effects relies, in part, upon projected differences in travel demand, travel time, and travel cost characteristics between the system alternatives and design options. The travel demand, time, and cost information for all alternatives was derived either directly or indirectly from the HSRA's intercity travel demand model. Since it was not feasible to test the Irvine Design Option (DO) with the HSRA's model, travel model results from several other HST scenarios were combined to create a set of travel demand and service level characteristics that would reasonably be expected to approximate conditions for an Irvine DO. These other HST scenarios included the following:

- **Scenario 6B.** This scenario represented the "base" HST alignment between San Francisco and San Diego via Pacheco Pass, the Grapevine, and the Inland Empire, with an additional extension to Sacramento. This scenario also included the higher air/auto growth rates, airfares, air travel times, and auto travel times from the four sensitivity tests as described in the Business Plan[1].

- **Option 2/6B.** This scenario included an HST alignment between San Francisco and Irvine via Pacheco Pass, the Grapevine, and Los Angeles Union Station (LAUS), with an additional extension to Sacramento. This scenario also included the higher air/auto growth rates, airfares, air travel times, and auto travel times from the four sensitivity tests as described in the Business Plan.

This appendix describes the methodology that was used to estimate travel demand and service level (travel time and cost) characteristics for the HST Irvine DO. The Irvine DO includes the basic HST alignment from Scenario 6B, and a "stub" extension from Los Angeles Union Station (LAUS) to Irvine via Norwalk and Anaheim.

[1] California High-Speed Rail Authority, *Final Business Plan*, June 2000, pp. 29-30.

B.2 Transportation Demand and Service Level Assumptions for Non-Orange County Trips

The Irvine DO is nearly identical to Scenario 6B for trips that do not involve an Orange County origin or destination. In particular, the travel demand characteristics for all modes were determined to be identical for non-Orange County trips. Therefore, for non-Orange County trips, travel demand and service level characteristics on all modes for the Irvine DO were assumed to be identical to the corresponding values from Scenario 6B.

B.3 Service Level Assumptions for Orange County Trips

For trips that involve an Orange County origin or destination, service level characteristics for the air, rail, and auto modes were assumed to be identical to the corresponding values from Scenario 6B. Service level characteristics for the HST mode were assumed to be identical to the corresponding values from Option 2/6B, except for the Orange-San Diego travel market.

In the Orange-San Diego, market, HST service level characteristics for the Irvine DO are a hybrid of values from Scenario 6B and Option 2/6B. Table B.1 illustrates values for the different service characteristics from Scenario 6B (between San Diego and Orange, Los Angeles and Riverside Counties) and Option 2/6B (between San Diego and Orange on HST and conventional rail). The right-most column in Table B.11 reflects the consensus hybrid values for the Irvine DO; these values reflect the following trade-off principles:

- No single scenario directly replicates the conditions that will exist for the Orange-San Diego travel market under the Irvine DO.
- HST travelers between Orange and San Diego could use stations in Riverside, Ontario, East San Gabriel Valley, Norwalk, Anaheim, or Irvine depending upon their actual origin or destination in Orange County. The HST times and costs reflect an average of the values for use of these different stations.
- Out of vehicle time (OVT) for the Irvine DO was assumed to be equal to the Scenario 6B value since Scenario 6B better reflects the time difference between business and non-business trips.
- Travel costs for the Irvine DO were assumed to be equal to the Scenario 6B value since Scenario 6B better reflects the costs for direct HST service into San Diego while also reflecting the cost premium for HST service into Orange County.

Table B.1 Comparison Of Service Level Characteristics

	Scenario 6B (HST)			Option 2/6B (Orange-San Diego)		Irvine DO
	Orange-San Diego	Los Angeles-San Diego	Riverside-San Diego	HST	Conventional Rail	Orange-San Diego
In-Vehicle Travel Time	60	78	37	54	166	**90**
Access Time-Business	84	70	76	163	27	**58**
Access Time - Non-Business	5	64	67	147	25	**50**
Out-of-Vehicle Time (OVT) – Business	8	7	8	10	54	**8**
Out-of-Vehicle Time (OVT) – Non-Business	12	11	12	10	61	**12**
Travel Cost – Business	$63	$53	$58	$113	$32	**$63**
Travel Cost – Non-Business	$41	$33	$37	$75	$27	**$41**

- The sum of in-vehicle travel time (IVTT) and access/egress time for the Irvine DO should be similar to the sum under Scenario 6B since both of these scenarios include direct HST service between the Los Angeles area and San Diego. However, the Irvine DO is assumed to have a larger IVTT and lower access/egress time than under Scenario 6B since more direct HST service would be available into the core of Orange County.

- Orange-San Diego is assumed to have an average IVTT of 90 minutes. This IVTT reflects the 78 minute IVTT between Los Angeles and San Diego under Scenario 6B combined with the 25 minute average line-haul time between Orange and Los Angeles Counties under Option 2/6B. The time also reflects the possibility of shorter line-haul time for people who use Ontario or Riverside stations for trips to and from Orange.

- Orange-San Diego is assumed to have an average access/egress time of 58 minutes for business trips and 50 minutes for non-business trips. These times reflect the shorter access/egress times that are possible with direct service into Orange County (as confirmed by the various travel times for conventional rail under Option 2/6B), as well as longer access/egress times for people who use Los Angeles, Ontario or Riverside stations for trips to and from Orange.

B.3 Transportation Demand for Orange County Trips

Travel demand estimates for trips that involve an Orange County origin or destination were assumed to be identical to the corresponding values from Option 2/6B, except for the Orange-San Diego travel market. This assumption holds for all modes since the Irvine DO is identical to Option2/6B for areas north of Orange County. (Trips from Orange

County to/from Eastern Los Angeles, San Bernardino, and Riverside Counties are not included in the HST travel model since they are not considered to be intercity; therefore, differences between the Irvine DO and Option 2/6B east of LAUS are not relevant for this assumption.)

Travel demand for air and auto trips between Orange and San Diego for the Irvine DO were assumed to be the same as existed under Scenario 6B. This assumption recognizes that air trips were essentially "0" for this travel market in Scenario 6B, and that there is no relative difference in the competitive position (i.e., time and cost) between auto and HST for Scenario 6B and Option 2/6B.

For conventional rail and HST between Orange and San Diego, the remaining conventional rail trips (44,461 business trips and 44,090 non-business trips) from Scenario 6B were assumed to be diverted to HST since HST would directly serve the same major markets as conventional rail (e.g., Irvine, Anaheim, Downtown San Diego) under the Irvine DO. These conventional rail trips were added to the HST trips from Scenario 6B to arrive at an estimate of total HST trips under the Irvine DO.

B.4 Service Implementation Assumptions

For the Irvine DO, the "stub" extension between LAUS and Irvine was assumed to be open for service on January 1, 2019. Service implementation on other segments was assumed to follow the same schedule as set for the base HST Alternative and other design options.

Appendix C

Estimation of User Benefits

Appendix C. Estimation of User Benefits

Travel efficiency benefits for users of the HST system were estimated separately for intercity business users, intercity non-business users, and long-distance commuters. The benefits are estimated through a process known as a log-sum calculation. Using this process, the total benefit for switching from each mode to HST is calculated as a function of the log sum of utilities for travelers of that mode, using the following equation:

$$B_{mode} = \frac{\mu_{mode} - \ln(e^{\mu_{mode}} + e^{\mu_{HSR}})}{\beta_{cost}}$$

where B_{mode} is the total benefit for that mode, μ_{mode} is the utility of travel on that mode, μ_{HSR} is the utility of travel on high speed train, and β_{cost} is the coefficient of cost for travel on that mode (to monetize the benefits). The utility of a particular mode is calculated as a function of travel time and out-of-pocket costs, as follows:

$$\mu_{mode} = \alpha + \beta_{xost} \times Cost + \beta_{IVT} \times IVT + \beta_{Access} \times Access + \beta_{OVT} \times OVT$$

Where β_{cost} is the coefficient of cost for travel on that mode, β_{IVT} is the coefficient of line haul (in vehicle) time on that mode, β_{Access} is the coefficient of access/egress time on that mode, and β_{OVT} is the coefficient of out-of-vehicle (i.e., wait, terminal processing, etc.) on that mode.

These calculations use coefficients from the mode choice model developed for previous work by the HSRA, and travel time and cost information developed for the project as described in the main body of the final report. The mode choice coefficients for the relevant modes are shown in Table C.1. Monetary values that resulted from these coefficients were adjusted to 2002 dollars for purposes of the REMI analysis.

Table C.1 Values of Time from Previous HST Mode Choice Models

	Local Air	Conventional Rail	Private Auto	
			Short Distance	Long Distance
Business Trips				
Modal Constant	0.0993	0.7848	-0.6600	-0.7995
Line-haul Time (IVT)	-0.0357	-0.0254	-0.0142	-0.0110
Access/Egress Time	-0.0382	-0.0325	-0.0175*	-0.0184
Wait Time (OVT)	-0.0207	-0.0225		-0.0060
Cost	-0.0505	-0.1046	-0.0450	-0.026
Non-Business Trips				
Modal Constant	0.1174	0.5226	-1.0369	-0.8768
Line-haul Time (IVT)	-0.0373	-0.0197	-0.0057	-0.0066
Access/Egress Time	-0.0141	-0.0212	-0.035**	-0.0093
Wait Time (OVT)	-0.0321	-0.0144		-0.0031
Cost	-0.0744	-0.0860	-0.0553	-0.0293

Source: Charles River Associates, 1996.
Notes:
* This access/egress coefficient is applied the following ratio of travel times – (*OVT*)*(1.5**access*)/*IVT*.
** This access/egress coefficient is applied the following ratio of travel times – (0.5**OVT*)* (1.5**access*)/*IVT*.

Appendix D

Estimation of Non-User Benefits

Appendix D. Estimation of Non-User Benefits

This appendix describes technical procedures that were followed to estimate non-user benefits for the HST Alternative. The term "non-user benefits" refers to savings that accrue to individuals who do not use the HST system after service begins. Nonetheless, these individuals might receive residual benefits from travel delay reductions or related areas that arise from diversion of trips to HST from auto, air, and/or conventional rail modes. This appendix describes benefits in the areas of intercity highway travel, long-distance commuting, and air travel.

D.1 Auto Delay Reduction Benefits

The HST Alternative involves diversion of trips from the auto mode to the HST mode. The alternative also assumes that the highway network from the No-Project Alternative remains in place to serve the remaining auto demand of the HST Alternative. The combination of constant highway capacity, decreased intercity travel demand via auto, and overall fixed trip table[1] will lead to reductions in travel delay for individuals who remain in the auto mode.

The methodology for estimating the auto delay reduction benefits for the HST Alternative uses the Bureau of Public Roads (BPR) *Volume Delay Function* (VDF) curves, and results in an intercounty travel time for the HST Alternative that is expressed in relation to the travel time for the No-Project Alternative. This methodology was also followed to estimate travel time savings for the Modal Alternative (see Appendix A).

Key Assumptions

The methodology assumes that the No-Project Alternative, which is estimated to serve 215.54 million intercity auto trips in 2020, represents capacity conditions on the intercity

[1] It is recognized that considerable debate exists as to the potential of highway capacity improvements to induce further highway travel. This induced travel may, in turn, reduce the travel time benefit that a highway capacity improvement could provide under assumptions of a fixed level of travel demand. Nonetheless, the fixed travel demand (i.e., fixed trip tables) assumption is fairly standard professional practice in transportation studies, and was also adopted for the Modal Alternative in this project.

highway system. In other words, it is assumed that the volume-to-capacity (V/C) ratio is equal to 1.0 in all HST intercity markets for the No-Project Alternative. The methodology also assumes that the HST Alternative will serve 195.94 million intercity auto trips in 2020.

Volume and Capacity

As noted previously, the HST Alternative has a lower demand for auto travel than the No-Project Alternative. The HST Alternative has 9.1 percent fewer trips than the No-Project Alternative (or "0.909V" using the previous V and C designations). The HST Alternative is also assumed to have identical freeway capacity as the No-Project Alternative for the freeway corridors that serve these trips.

Travel Time Derivation

For the No-Project Alternative, it was assumed that the V/C ratio is equal to 1.0 (volume equals capacity). Therefore, applying the BPR equation results in:

$$Time(NB) = T(FF) * (1 + 0.15 * (Volume / Capacity)\text{^}4)$$ *(Note: This is the standard BPR equation.)*

$$Time(NB) = T(FF) * (1 + 0.15 * (V / C)\text{^}4)$$

$$Time(NB) = T(FF) * (1 + 0.15 * (1)\text{^}4)$$

$$Time(NB) = 1.15 * T(FF)$$

Where:

Time(NB) = Travel time via auto for the No-Project Alternative;

Time(FF) = Free-flow travel time via auto;

V = Representative intercity trips by auto for the No-Project Alternative; and

C = Representative auto capacity for intercity trips for the No-Project Alternative.

For the HST Alternative, the volume and capacity changes noted in the previous sections get applied to the same BPR equation, resulting in:

$$Time(M) = T(FF) * (1 + 0.15 * (Volume / Capacity)\text{^}4)$$

$$Time(M) = T(FF) * (1 + 0.15 * (0.909V / C)\text{^}4)$$

$$Time(M) = T(FF) * (1 + 0.15 * (0.6829))$$ *(Note: V and C cancel each other out.)*

$$Time(M) = 1.10 * T(FF)$$

$$Time(M) = 1.10 * \left(T(NB)/1.15\right)$$ *(Note: Substitute from above set of equations.)*

$$Time(M) = 0.959 * T(NB)$$

Where:

Time(M) = Travel time via auto for the HST Alternative; and

Time(FF), V, and C = Same as above.

This methodology resulted in a 4.1 percent travel time reduction for intercity auto trips in the HST corridors. This reduction was assumed to apply uniformly across all HST corridors, and to both business and non-business trips.

These values for the HST Alternative are expressed as a reduction from the corresponding travel times in the No-Project Alternative. As noted in the main report, for purposes of the growth effects analysis, the No-Project Alternative was assumed to follow the Business Plan auto travel time assumptions from Sensitivity Test 3, which involved a travel time increase of 30 minutes for auto trips to, from, or through the Los Angeles and Bay Area regions.

Monetary Benefits

The 4.1 percent travel time saving was applied to the travel time for each county-to-county travel pair for both business and non-business trips to estimate the total time saved per traveler. This per-traveler time savings was multiplied by the total number of business and non-business travelers that remain in auto mode after introduction of HST, and then summed to determine the total time savings by county-to-county pair for business and non-business trips. Finally, the travel distance of each county-to-county pair was estimated, and the appropriate travel time values from Table D.1 were applied to each time component to convert time savings to monetary values.

Table D.1 Assumed Values of Auto Travel Time for Intercity Trips (1996 Dollars)

Market Segment	Business Trips	Non-Business Trips
Short Distance Auto Trips (less than 150 miles)	$18.93	$6.21
Long Distance Auto Trips (150 miles or more)	$25.39	$13.53

Sources: Charles Rivers Associates, Inc., 1996; and Cambridge Systematics, Inc., 2003.

Benefits Beyond 2020

It was assumed that, beyond 2020, investments would continue to be made in California's transportation system at a level sufficient to maintain the transportation service levels that would be experienced in 2020. In terms of the auto delay reduction analysis, this planning assumption meant that auto travel times both with and without HST would remain constant between 2020 and 2040. Therefore, the per-traveler time saving was assumed to remain constant from 2020 to 2040. This time saving was applied to estimates of auto trips in year 2040 (using estimates described in Section 2.0 of the main report), with the procedure described in the previous section. Values were then interpolated for each year between 2020 and 2035.

Total monetary benefits from delay reduction for intercity auto trips are summarized in Table D.2 for years 2020 and 2040.

Table D.2 Statewide Monetary Benefits for Intercity Auto Delay Reduction (Millions of 1996 Dollars)

			HST Alternative			
			Design Option			
	Analysis Year	Modal Alternative	Base, East Bay, and Outlying Station	Diablo Direct	Palmdale	Irvine
Intercity Trip Purpose	2020	456.6	128.1	128.0	128.6	127.3
	2040	908.1	190.4	190.4	190.4	190.4
Non-Business Trips	2020	576.0	167.2	167.2	167.2	167.2
	2040	1,146.3	248.5	248.5	248.5	248.5

Source: Cambridge Systematics, Inc., 2003.

■ D.2 Long-Distance Commute Benefit

The Modal and HST Alternatives include features that could improve travel conditions for individuals traveling to or from work (i.e., commuters). In the case of the Modal Alternative, these features include additional freeway travel lanes that could reduce congestion in key commute corridors during regular commute hours. In the case of the HST Alternative, the new HST modal option and potential for commute-oriented HST service could divert auto commuters to HST, thereby, increasing their utility and decreasing the number of auto commuters on the freeway. Analysis methods were developed to estimate all of these benefits.

HST Alternative

Auto Travel Time Savings

Commute travel time savings were estimated on a corridor basis for three primary commute corridors that were roughly adjacent to potential HST alignments:

1. **South and east of Los Angeles Union Station (LAUS) –** A corridor from Downtown Los Angeles to Downtown San Diego roughly following Interstate 10 and SR 60 between LAUS and Riverside, and Interstates 15 and 215 between Riverside and San Diego;

2. **North and west of LAUS –** A corridor from Downtown Los Angeles to the Antelope Valley roughly following Interstate 5 and SR 14; and

3. **Bay Area –** A corridor from Downtown San Francisco to Los Banos roughly following U.S. 101 and Interstate 280.

The delay estimation methodology used county-to-county commute flows on HST and auto modes. The HST commute flows were taken from material previously developed by the HSRA[2], and reflected an approximate annual total of 10 million commute trips; the annual trip totals were converted to daily values by assuming 260 work days per year.

Auto commute flows were estimated from regional travel demand models maintained by the Metropolitan Transportation Commission (MTC), the Southern California Association of Governments (SCAG), and the San Diego Association of Governments (SANDAG). The regional models were used to identify vehicle trips and average travel time during a three-hour a.m. peak period for all county-to-county pairs that shared the same travel corridors served in whole or in part by HST. These values were assumed to represent conditions under the No-Project Alternative.

For each of the three corridors, the number of auto commute trips diverted to HST was calculated assuming average vehicle occupancy of 1.107 for commute trips.[3] The standard BPR equation, as described in the previous section, was then applied to estimate the change in commute travel time in each corridor created by the diversion of commute trips to HST.[4] This time saving was combined with the average commute travel time in each corridor (from the regional travel models) to estimate the time saved per remaining auto commute trip. This per-trip time savings was multiplied by the number of remaining auto

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[2] *Independent Ridership and Passenger Revenue Projections for High-Speed Rail Alternatives in California*, prepared for the California High-Speed Rail Authority by Charles River Associates, January 2000, pp. 73-89.

[3] Value derived from MTC travel demand model for home-based work trips.

[4] As with the analysis of intercity auto delay reduction, the analysis of long-distance commute benefits assumed a fixed trip table for each corridor during the a.m. peak period.

commuters and expanded to find total annual commute time savings in the a.m. and p.m. peak hours. Finally, the total time savings was multiplied by an assumed value of time of $18.93[5] to find the monetary equivalent of this estimated savings.

The growth in commute trips from 2020 to 2040 was set equal to population growth rates in each corridor, and was calculated independently for each mode. The 2040 analysis assumed that highway investments would continue to be made beyond 2020 at a level sufficient to maintain average travel time in each corridor under the No-Project Alternative at year 2020 levels. Commute time savings for 2020 and 2040 are summarized in Table D.3 for the three commute corridors.

Table D.3 Estimated Time Savings for Auto Commuters

Commute Corridor	Analysis Year	Annual Time Saved (Thousands of Hours)		
		Modal Alternative	HST Alternative	HST Alternative – Palmdale Design Option
San Diego – LAUS	2020	42,059	871	871
	2040	55,247	1,148	1,148
Antelope Valley – LAUS	2020	30,545	599	968
	2040	36,647	719	1,162
Los Banos – San Francisco	2020	5,377	594	594
	2040	5,981	663	663

Source: Cambridge Systematics, Inc., 2003.

Travel Efficiency Benefits for HST Commuters

Travel efficiency benefits for intercity business and non-business HST trips were estimated using the mode choice coefficients from the HSRA's travel demand model, as described in Appendix C. These coefficients could not be used for commute trips, however, since regional travel models maintained by MTC, SCAG, and SANDAG had originally been used to forecast long-distance commute potential of HST. These regional travel models have mode-choice coefficients that are different from each other and from the HSRA's travel demand model. Therefore, this analysis relied on travel efficiency estimates that had been developed in previous HSRA studies[6]. These statewide commute benefits were suballocated to individual counties based on each county's total estimated commute ridership on HST.

[5] The "value of time" for long-distance commute trips is assumed to equal the value for short-distance intercity auto trips for business-related purposes (see Table D.1).

[6] Op cit.

Modal Alternative

Estimation of commute-related travel time savings for the Modal Alternative followed the same basic data and procedures as used for the HST Alternative. Travel time savings were estimated on a corridor basis using four corridors instead of three (the LAUS to San Diego corridor was split into two corridors at the Riverside/San Diego county line for the Modal Alternative).

For each corridor, the average freeway capacity increase over the No-Project Alternative was estimated based on existing conditions and characteristics of each alternative as described in the *System Alternatives Definition* report. These average capacity increases were estimated as:

- **Bay Area (San Francisco to Gilroy) –** 19 percent freeway capacity increase;
- **North and West of LAUS –** 38 percent freeway capacity increase;
- **South and East of LAUS –** 19 percent freeway capacity increase; and
- **San Diego –** 22 percent freeway capacity increase.

The standard BPR equation, as described in the first section of this appendix, was applied to estimate the reduction in commute travel time in each corridor created by the freeway capacity increase[7]; this reduction ranged between 6.5 percent and 9.5 percent for the four corridors. This reduction was combined with the average commute travel time in each corridor (from the regional travel models) to estimate the average freeway time saved per auto commute trip. This per-trip time saving was multiplied by the number of freeway auto commuters[8] and expanded to find total annual commute time savings for auto commuters in the a.m. and p.m. peak hours. Finally, the total time savings were multiplied by an assumed value of time of $18.93 to find the monetary equivalent of this estimated savings.

As with the HST Alternative, the growth in commute trips from 2020 to 2040 was set equal population growth rates in each corridor. The 2040 analysis assumed that highway investments would continue to be made beyond 2020 at a level sufficient to maintain the year 2020 reduction in commute travel time. Commute time savings for 2020 and 2040 are summarized in Table D.3; values for the "San Diego" and "south and east of LAUS" corridors are combined into the rows for "San Diego – Los Angeles Union Station."

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[7] As with other auto-related travel time analyses for this study, it was assumed that the No-Project Alternative represented capacity conditions on roadways during commute hours. Therefore, freeway lane additions for the Modal Alternative represent improvements from the capacity condition. Also, a fixed trip table was assumed for each corridor during the a.m. peak period.

[8] Data from the MTC travel model indicated that 57 percent of commute-related vehicle-miles traveled (VMT) in the a.m. peak period occurs on freeways. This value was assumed to represent the proportion of total commute trips that occur on freeways, and was, therefore, used to adjust the total auto commute trips in each corridor to represent "freeway auto commuters."

D.3 Air Delay Reduction Benefits

The Modal and HST Alternatives include transportation system changes that could lead to delay reductions for air travelers when compared to the No-Project Alternative. Specifically, terminal expansion and runway additions at major airports under the Modal Alternative could increase capacity for intrastate, interstate, and international flights, thereby, reducing delays for flight takeoffs and landings. Similarly, reduction in intrastate air travel with the HST Alternative could reduce the number of intrastate flights needed to accommodate this air demand, thereby, saving time for remaining intrastate, interstate, and international air travelers due to fewer takeoffs and landings at major airports.

This analysis considered the potential for air delay reduction benefits at airports throughout California. As with a previous analysis performed for the HSRA,[9] this analysis focused on airside delay reductions to passengers and aircraft operations at nine major airports in California. Unlike the earlier analysis, however, this current analysis considered the potential for air delay reduction benefits to accrue to other locations throughout the State. Although air carrier airports in these other locations were unlikely to experience meaningful changes in airside travel time, a portion of the air delay reduction benefit from major airports would actually accrue to the regions around these other airports due to changes in overall flight time for intrastate air travel.

Airport Capacity

Airport capacity was determined on a regional basis, which allowed for continuation of assumptions from the earlier HSRA work that flights (particularly intrastate) could shift from airports with high levels of delay to less congested airports in the same region. The following regional groupings were used for major airports:

- **Los Angeles –** Los Angeles International, Burbank-Glendale-Pasadena; Ontario International, and Orange County (John Wayne Airport).
- **Bay Area –** San Francisco International, San Jose International, and Oakland International.
- **Sacramento –** Sacramento International.
- **San Diego –** San Diego International (Lindbergh Field).

Airside operational capacity (annual service volume) was estimated on a regional basis using the existing number of runways and terminal gates, and improvements defined for

[9] *Independent Ridership and Passenger Revenue Projections for High-Speed Rail Alternatives in California*, Appendix A, Charles River Associates, January 2000.

the system alternatives.[10] For this analysis, it was assumed that runway and terminal configurations were identical between the No-Project and HST Alternatives. Physical facilities were converted to operational capacity using the following assumptions:

- Gate utilization factor of 525,000 passengers per gate per year[11];
- Gate to runway ratio of 30[12]; and
- Average aircraft load of 74 passengers per operation[13].

The larger of the two values derived from runway and terminal gate improvements was assumed to represent the operational capacity in each region. A summary of the airport physical features and operational capacity used for this analysis is presented in Table D.4.

Table D.4 Airport Characteristics of the System Alternatives

Region	Airport Physical Features						Annual Service Volumes (Thousands of Operations)		
	Year 2002		Increase Over Year 2002						
			No-Project and HST Alternatives		Modal Alternative				
	Run-ways	Gates	Run-ways	Gates	Run-ways	Gates	Year 2002	No-Project/ HST	Modal
Los Angeles	10	194	0	24	2	51	2,153	2,323	2,578
Bay Area	10	172	0	29	2	64	1,267	1,473	1,721
Sacramento	2	30	0	14	1	20	315	414	528
San Diego	1	41	0	8	1	20	270	327	483

Air Travel Demand

Travel demand model results for each system alternative (see Section 2.2 of main report) provided the county-to-county air flows for intrastate air travel. These county-to-county flows were aggregated to regional flows totals using counties within the four major

[10] *System Alternatives Definition – Deliberative Draft*, California High-Speed Rail Authority, November 18, 2002

[11] ibid

[12] ibid

[13] This value is a statewide average for major airports, and was derived from data presented in Appendix A of the *Independent Ridership and Passenger Revenue Projections for High-Speed Rail Alternatives in California.*

regions and three other minor regions. This allocation of counties, which considered the structures of the REMI and travel demand models, was as follows:

- **Los Angeles –** Los Angeles, Orange, Riverside, San Bernardino, and Ventura;
- **Bay Area –** Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma;
- **Sacramento –** El Dorado, Placer, Sacramento, Sutter, and Yolo;
- **San Diego –** San Diego;
- **Northern Central Valley –** Merced, San Joaquin, and Stanislaus;
- **Southern Central Valley –** Fresno, Kern, Kings, Madera, and Tulare; and
- **Rest of State –** Monterrey, San Benito, and Santa Cruz.

Estimates were also made of interstate and international enplanements and deplanements in each major region. These estimates were based on results from a previous HSRA analysis that had used travel model results for the Business Plan assumptions.[14] The difference between total airport demand (from the HSRA analysis) and intrastate airport demand (from the Business Plan travel model results) provided a year 2020 estimate of interstate and international airport demand (enplanements and deplanements). The total regional airport demand for this current analysis was estimated as the sum of the interstate/international airport demand and the intrastate travel model results for each system alternative.

Commercial aircraft operations within each region were estimated using an assumed average of 74 passengers per operation.

Airport Delay

Regional airport delay was estimated for each system alternative and HST design option using the equation:[15]

$$Delay\ per\ aircraft\ operation\ (\min.) = 0.19 + 2.33 * \left(\frac{annual \quad opertions}{annual\ service\ volume} \right)^6$$

[14] *Independent Ridership and Passenger Revenue Projections for High-Speed Rail Alternatives in California*, Appendix A, Charles River Associates, January 2000.

[15] Levinson, D., and D. Gillen, *The Full Cost of Air Travel in the California Corridor*, presented at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1999. This equation was used in previous work by the HSRA.

Operations and service volume estimates for each system alternative were taken from previous steps. The delay reduction for the Modal and HST Alternatives was derived by subtracting the delay value from these alternatives from the delay value for the No-Project Alternative. Delay reductions, which ranged from 0.1 minute at Sacramento up to 12 to 14 minutes at San Diego, are summarized in Tables D.5 and D.6.

Table D.5 Annual Delay Reduction from No-Project Alternative for Aircraft Operations

	Modal Alternative			HST Alternative (Base, East Bay, and Outlying Stations Design Options)		
	Time Saved per Operation (Min.)	Annual Delay Reduction (Thousands of Passenger Hours)		Time Saved Per Operation (Min.)	Annual Delay Reduction (Thousands of Passenger Hours)	
		2020	2040		2020	2040
Los Angeles Region	1.20	3,485	6,934	1.63	5,272	10,490
Bay Area	3.71	7,915	15,749	4.53	10,441	20,776
Sacramento	0.10	33	65	0.12	60	119
San Diego	14.31	7,948	15,815	12.41	7,350	14,625
Northern Central Valley	–	30	59	–	1	2
Southern Central Valley	–	42	83	–	0	0
Rest of State	–	370	737	–	8	15
Statewide Total	**–**	**19,822**	**39,443**	**–**	**23,132**	**46,027**

Source: Cambridge Systematics, Inc., 2003.

Table D.6 Annual Delay Reduction from No-Project Alternative for Aircraft Operations – HST Design Options

	HST Alternative – Palmdale Design Option			HST Alternative – Diablo Direct Design Option		
	Time Saved per Operation (Min.)	Annual Delay Reduction (Thousands of Passenger Hours)		Time Saved per Operation (Min.)	Annual Delay Reduction (Thousands of Passenger Hours)	
		2020	2040		2020	2040
Los Angeles Region	1.63	5,255	10,457	1.63	5,272	10,490
Bay Area	4.51	10,402	20,699	4.53	10,440	20,772
Sacramento	0.12	60	119	0.12	60	119
San Diego	12.33	7,307	14,538	12.41	7,350	14,626
Northern Central Valley	–	0	0	–	0	0
Southern Central Valley	–	0	0	–	0	0
Rest of State	–	0	1,463	–	1	3
Statewide Total	**–**	**23,025**	**45,815**	**–**	**23,123**	**46,010**

Source: Cambridge Systematics, Inc., 2003.

Table D.6 Annual Delay Reduction from No-Project Alternative for Aircraft Operations – HST Design Options (continued)

	HST Alternative – Irvine Design Option		
	Time Saved per Operation (Min.)	Annual Delay Reduction (Thousands of Passenger Hours)	
		2020	2040
Los Angeles Region	1.64	5,287	10,520
Bay Area	4.54	10,466	20,826
Sacramento	0.12	60	120
San Diego	12.41	7,350	14,625
Northern Central Valley	–	0	0
Southern Central Valley	–	0	0
Rest of State	–	1	1
Statewide Total	**–**	**23,164**	**46,091**

Source: Cambridge Systematics, Inc., 2003.

Total delay reduction was calculated for aircraft operators and air travelers in each region by multiplying the delay reduction per operation by the estimated number of aircraft operations and air travel demand, respectively. Separate tabulations were maintained for intrastate and interstate/international travelers.

Total regional delay savings for air travelers were split into business and non-business components, assuming that business travel represented about 44.4 percent of total air travel. This percentage represents a statewide average for intrastate air travel using travel demand results from the No-Project and Modal Alternatives.[16] This percentage was assumed to apply equally to intrastate and interstate/international air travelers.

A portion of the delay reduction within the four major regions was assumed to accrue to airports elsewhere in the State. This allocation considered time savings for intrastate air travelers from the northern and southern Central Valley and the rest of the State that travel into or through airports in one of the four major regions. Average delay reductions for flights at each major airport were applied to estimates of air travel between the four major regions and elsewhere in the State. The resulting delay reductions were applied to the other airports, and then subtracted from the original delay reduction estimates for the major airports (to avoid double-counting of benefits).

Delay reduction estimates were also prepared for a 2040 forecast year by assuming 3.5 percent annual growth rate in air demand across all alternatives beyond 2020; this

[16]The HST Alternative included almost no intrastate air travel and was, therefore, not used to derive this percentage.

assumption represents a continuation of characteristics of *Sensitivity Analysis 1*[17]. It was also assumed that, beyond 2020, continued investments would be made in the State's airport system to maintain year 2020 delay levels (per aircraft operation) for each alternative and design option. Therefore, the growth in delay reduction benefits from 2020 to 2040 was essentially driven by growth in air travel demand.

Delay reduction summaries by region for air travelers are presented in Table D.5 for the Modal and HST Alternatives, and Table D.6 for the HST design options. These tables include values for years 2020 and 2040.

Monetized Benefits

The delay reduction benefits were converted to monetary benefits using the following "values of time" (expressed in 1996 dollars)[18]:

- $40.91 per hour for a business traveler;
- $30.00 per hour for a non-business traveler; and
- $1,964.01 per aircraft operating hour.

The monetary benefits were assumed to accrue one-half at the origin end and one-half at the destination end of each trip. For interstate and international flights, this assumption means that one-half of delay savings is "lost" to some other location, either domestically or internationally.

[17] California High-Speed Rail Authority, *Final Business Plan*, June 2000, pp. 29-30.

[18] "Values of time" were derived from data presented in Appendix A of the *Independent Ridership and Passenger Revenue Projections for High-Speed Rail Alternatives in California*. The aircraft operating cost is a statewide average for major airports.

Appendix E

Analysis of Business Attraction

Appendix E. Analysis of Business Attraction

This analysis considered the potential for firms to change their location and expansion decisions based on improved accessibility to markets. This type of effect is over and above the economic effects of travel efficiency benefits, and addresses two key phenomenons:

- The potential for new business attraction or a shifting of firm location within the State, rather than focusing on expansion of existing firms; and
- Influences of changes in accessibility to markets and key transportation nodes (i.e., labor force, buyers, suppliers, intermodal terminals, etc.) rather than the direct changes in travel demand, time, and cost that are the basis for the travel efficiency benefits.

The general effects of transportation investments on local economic development will depend on changes in accessibility to input (workers and supplies) and output markets, industry sector characteristics, and local economic characteristics. These three factors, which are summarized in Table E.1, comprise the general framework used in business attraction models (BAM). Modeling the effects of any particular transportation improvement, however, requires fine-tuning of a generalized BAM to capture the unique characteristics associated with the affected transportation modes, and the economic geography of the areas being modeled.

E.1 Business Attraction Framework

Accessibility Measures

Accessibility effects capture the absolute influence of transportation improvements on access to labor, supplier, and buyer markets. The relevant radius for labor market access is generally smaller (e.g., 60 to 90 minutes) than for supplier and buyer market access (e.g., 180 to 240 minutes). Accessibility measures capture the effects of transportation improvements on existing firms in an area that will experience lower transportation costs, as well as the overall attractiveness of an area as a site for new firms. Transportation improvements also improve access to regional and international markets by reducing the time and costs to key transportation modes, e.g., airports, rail centers, sea and river ports. The level of these improvements is measured by the percent reduction in time needed to access these modes and points.

Table E.1 General Business Attraction Modeling Framework

Factor	Element	General Indicator
Accessibility Measures	Product Markets and Suppliers	Level of economic activity within radius
	Regional/International Markets	Time to airports, rail centers, ports, etc.
	Labor Market Access	Number of workers within fixed radius
Local Area Characteristics	Labor Cost	Relative manufacturing wage
	Office/Warehouse Cost	Relative rents or land/housing costs
	Skilled Workers	Percent of population with bachelor's degree
Industry Sector Characteristics	Space Intensity	Average floor space per worker
	Skill Intensity	Percent production workers; average wage
	Transportation Intensity	Transportation as % of production costs

Local Area Characteristics

Improvements in accessibility interact with *local economic characteristics*, including land and labor costs and workforce characteristics, to determine the overall level of economic benefit associated with improved transportation networks. For existing firms, access to new sources of labor is a key factor, with improved access, firms might increase market share or expand the range of activities at existing sites. New firm locations are influenced by similar factors. For example, areas with relatively low-cost land and labor can expect to increase their chances of attracting labor- and land-intensive industrial activities, while those with access to highly-skilled labor will be attractive to skilled manufacturing, high-end services, management, and engineering activities.

Industry Sector Characteristics

Industry Sector characteristics, then, are important for identifying the types of industries that will be drawn to an area after transportation improvements. The key industry sector characteristics modeled include:

- The space intensity of the industry, which measures the average amount of floor space required for each worker;
- Skill intensity, which captures each industry's dependence on skilled labor; and

- Transportation intensity, which reflects the percent of total production costs that go to transportation-related expenses.

Local areas with low costs of industrial space (e.g., land, offices, plants, warehouses) will be attractive to industries that require large amounts of footage per employee. Local areas with a high proportion of skilled workers will be attractive to industries that require highly-skilled workers in production and support activities, like research and development. In all cases, industries with higher transportation intensities will be more strongly affected by improvements – and associated cost and time savings – associated with infrastructure improvements.

E.2 Modeling Transportation Alternatives for California

Business Attraction Model Modifications

Two primary modifications had to be made to the BAM for this project. First, unlike highway or airport improvements that increase the efficiency with which people *and* freight can be transported, international experience suggests that HST is used almost exclusively for the transport of people. To address this, modifications were made to categorize industries based on the relative weights of personnel versus freight movements in total transportation costs. Second, the economic geography of California is unique: unlike rural areas, where economic activity is more dispersed and networked, or states such as Massachusetts, where a large portion of economic activity is centered around one city (Boston), California is characterized by two primary concentrations of activity – the Bay Area and Los Angeles. To address this, each county affected by HST was categorized according to the likely influence of the Bay Area and Los Angeles on their business attraction potential. Modifications to the BAM used for analysis of California HST are summarized in Table E.2.

For the HST Alternative and design options, two sets of business attraction effects were modeled:

- The direct accessibility effects of the introduction of HST; and

- The indirect benefits associated with reductions in highway congestion as highway users switch to HST.

For the Modal Alternative, impacts of improved highway and airport infrastructure on accessibility were modeled. In addition, in both cases, improvements associated with access to international airports, and thus ease with which major national and international markets can be accessed were modeled.

Table E.2 Modifications to General Business Attraction Model for HST Analysis

Factor	Unique Feature	Modification to BAM
Modal Characteristics	HST transports primarily people	Industry dependence on business travel
	Other modes transport people and freight	Industry dependence on freight movements
Local Area Characteristics	Concentration of activity in Bay Area	Develop production costs for each county in Bay Area and Northern Central Valley relative to San Francisco
	Concentration of activity in Los Angeles	Develop production costs for each county in Southern California and Southern Central Valley relative to Los Angeles
Industry Sector Characteristics	Cost competitiveness	Off/plant and labor costs
	Skill base	Educational attainment levels

For new business attraction, the analysis of HST and highway infrastructure effects proceeded in three steps:

1. Estimation of labor, market, and airport accessibility numbers, with changes used to generate estimates of the overall increases in market size;

2. Characterization of industry sector to estimate the potential of change on activity in each industry, based on the industry's transportation and skill requirements; and

3. Characterization of each county's business environment to translate potential maximum industry sector growth into actual business attraction by county.

In short, the process can be thought of as a matching between industry sector demands and county characteristics that yields estimates of business attraction by industry, county, and mode.

Labor, Market, and Airport Accessibility

Introduction of HST and improvements in highways and airports will increase access to labor and output markets. For HST modeling, the increase in labor market accessibility was modeled by the increase in the number of workers (as proxied by total employment levels) within a 90-minute radius; for highway improvements, a 60-minute radius was used. Different radii were used to reflect different valuations of time for commuters in each mode: while HST commuters, can read, write, and work while commuting, highway users cannot. The proportion of lost time will be higher for highway commuters and, accordingly, acceptable commute lengths lower.

In both alternatives, increased market access is modeled by the change in access to economic activity (as proxied by total employment levels) within a 180-minute radius. With improved market access, existing firms (that can be assumed to have already developed some competitive advantage) expand the potential market areas for their products. These improvements translate into greater sales and employment for existing firms. Thus, firms in counties like Los Angeles, with a broad and deep economic base already in place, are expected to experience growth in the size or range of functions by firms already located there as the effective market area expands. At the same time, greater market access makes peripheral counties with less developed economic bases more attractive locations for the siting of new firms. With improved access, smaller or more remote counties enjoy a greater effective market area and become more attractive than in the past vis-à-vis large economic centers like Los Angeles and San Francisco. In this way, improved market access will be expected to increase the competitiveness of all sites relative to other locations in the U.S., while at the same time, improving the attractiveness of California counties that lie on the periphery of the existing industrial centers.

The accessibility estimates were prepared in a GIS processor that used the travel time information prepared for the overall REMI Analysis (see Sections 2.0 and 3.0 of the main report). The GIS processor determined, for each county, the other counties that could be reached within 90-minute and 180-minute time bands; this assessment was made separately for business and non-business trips, each travel mode, and each system alternative and HST design option. The time band information was then combined with the year 2020 population and employment forecasts to estimate the total labor and business market access in each county (for each trip purpose, mode and alternative).

Industry Sector Characteristics

The effect of industry sector characteristics were modeled based on the intensity and type (i.e., the relative importance of freight shipments versus personnel movements) of transportation requirements associated with each industry. Intuitively, access to HST would seem to affect most strongly industries, such as legal services, finance, insurance, and management services that utilize transportation services primarily to move persons, (an assumption borne out by case studies of business attraction effects of HST in Europe, North America, and Asia). Improvements in highways, on the other hand, will more strongly influence industries that utilize transportation services primarily to move freight, such as manufacturing, warehousing, and distribution firms.

Industry estimates of freight versus personnel movement were developed based on typical business travel expenses calculated from national input/output coefficients from the U.S. Bureau of Economic Analysis. Effects on different industry sectors will also be influenced by the types of workers required by each industry. In general, industries that require higher proportions of skilled and specialized labor benefit from improved labor market access more than those that rely more heavily on low-skilled workers. To capture this effect, skill-intensity measures were developed for each industry based on the proportions of production and non-production workers and average industry sector wages, as reported by the U.S. Department of Labor.

County Characteristics

Two sets of county characteristics were developed:

- Cost-competitiveness, based on local labor and office/plant/warehouse costs; and
- Workforce characteristics, based on educational attainment levels of the population in each county.[1]

For each county in the Bay Area and northern Central Valley, an overall indicator of cost competitiveness was determined by the costs of land and labor relative to San Francisco County; for counties in the southern Central Valley and Southern California, comparisons were made to Los Angeles County. In conjunction with data on the baseline economic structure, i.e., employment levels by industry, in the comparator and other modeled counties, data on county characteristics provide a measure competitiveness of each county relative to the San Francisco and Los Angeles. Combined with county-level accessibility measures, these data are used to estimate the shift in economic activity from the comparator counties to the outlying counties.

Final Adjustments

Firms are likely to value transportation improvements differently depending on the nature of the investment and whether initial improvements are likely to deteriorate over time. HST investments represent a permanent change in transportation access, while highway related improvements (i.e., capacity increases or travel reduction due to diversion to HST) are susceptible to deterioration over time. In both cases, improvements in highway travel times may spur higher utilization of highways, thus diminishing some of the original congestion reduction. No such effect is associated with HST, where travel times are largely unaffected by the number of persons using the system. At the same time, investments in highway infrastructure are more easily discerned as leading to travel time improvements, and are also likely to be perceived as more permanent than those resulting from a reduction in the number of drivers. To capture these perception effects on business location decisions, initial job creation estimates associated with highway infrastructure were weighted by a factor of 0.75, those associated with a decline in the number of drivers were weighted by a factor of 0.5, and those associated with HST were not modified (i.e., were weighted by a factor of 1.0).

Adjustments were made to capture the likely "double-counting" of job creation estimates since a portion of new job creation in the counties affected by HST or highway improvements will come at the expense of the major urban areas (i.e., the Bay Area counties and

[1] Data on labor costs were taken from the *County Business Patterns*, U.S. Census Bureau; data on land and office costs were derived from county housing and rental costs from U.S. Census Bureau; county educational attainment levels were taken from U.S. Census Bureau.

Los Angeles County) and the California counties not affected by HST or highway improvements. To capture this affect, it was assumed that:

- A portion of the job creation in the northern Central Valley represents activities that, in the absence of HST and highway improvements, would have been sited in Bay Area counties;

- A portion of job creation in the southern Central Valley represents activities that would have been sited in Los Angeles County; and

- A portion of job creation in all affected counties represents activities that would have been sited in the "rest of state."

Adjustments for this "double-counting" required reducing initial job creation estimates for the Bay Area counties by 90 percent and reducing initial Los Angeles County estimates by 50 percent. After these adjustments were made, initial forecasts of employment estimates for the "rest of state" were reduced by an equivalent of 25 percent of the remaining employment impact to capture the likely shift in activity from counties not affected by HST and highway improvements to those that will be served by these improvements. Total employment impacts associated with new job creation were then phased in over a period of 10 years, to capture the lag between infrastructure improvements and firm responses and opportunities for siting new activities.

Appendix F

Detailed Tabulations of Traveler Benefits

Appendix F. Detailed Tabulations of Traveler Benefits

Table F.1 Traveler Benefit Detail for the Modal Alternative (Thousands of 1996 Dollars)

	2020					2040				
	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State
Mode Shift Benefits for Intercity Business Travelers	0	0	0	0	0	0	0	0	0	0
Mode Shift Benefits for Intercity Non-Business Travelers	0	0	0	0	0	0	0	0	0	0
Auto Delay Reductions for Business Travelers	109,135	75,538	36,078	187,300	48,527	217,135	150,181	71,698	372,560	96,498
Auto Delay Reductions for Non-Business Travelers	148,689	79,844	44,045	239,205	64,242	296,026	158,891	87,805	475,813	127,801
Accident Reductions for Business Travelers	(32)	(50)	(42)	(130)	(13)	(59)	(82)	(72)	(238)	(16)
Accident Reductions for Non-Business Travelers	(63)	(83)	(79)	(211)	(27)	(70)	(83)	(96)	(283)	(20)
Air Pollution Reductions for Business Travelers	(43)	(66)	(55)	(172)	(17)	(78)	(108)	(95)	(313)	(21)
Air Pollution Reductions for Non-Business Travelers	(83)	(110)	(104)	(278)	(35)	(93)	(110)	(127)	(373)	(26)
Mode Shift Benefits for Commuters	0	0	0	0	0	0	0	0	0	0
Auto Delay Reductions for Commuters	101,788	0	0	1,374,387	0	113,228	0	0	1,739,558	0
Air Delay Reductions for Business Travelers	113,408	1,218	985	164,297	8,741	225,659	2,423	1,960	326,916	17,393
Air Delay Reductions for Non-Business Travelers	74,271	340	0	107,598	0	147,783	677	0	214,097	0
Air Delay Reductions for Operators	139,139	1,090	638	201,574	5,665	276,858	2,168	1,270	401,089	11,272

Table F.2 Traveler Benefit Details for the HST Base Alternative, East Bay Design Option, and Outlying Stations Design Option (Thousands of 1996 Dollars)

	2020					2040				
	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State
Mode Shift Benefits for Intercity Business Travelers	659,793	164,396	95,881	1,189,234	192,620	1,300,656	320,644	186,824	2,334,641	379,869
Mode Shift Benefits for Intercity Non-Business Travelers	607,293	162,994	73,071	939,776	198,516	1,161,548	301,094	127,959	1,786,383	375,939
Auto Delay Reductions for Business Travelers	25,623	26,303	12,041	47,604	16,494	37,840	39,031	17,804	70,643	25,123
Auto Delay Reductions for Non-Business Travelers	38,294	26,588	15,415	64,950	21,924	56,308	39,381	22,808	96,125	33,858
Accident Reductions for Business Travelers	848	540	354	2,035	251	1,300	809	542	3,039	262
Accident Reductions for Non-Business Travelers	2,698	1,265	692	4,828	701	4,180	1,917	1,056	7,297	721
Air Pollution Reductions for Business Travelers	6,432	4,091	2,681	15,430	1,901	9,859	6,137	4,109	23,039	1,988
Air Pollution Reductions for Non-Business Travelers	20,454	9,590	5,245	36,606	5,312	31,694	14,531	8,006	55,326	5,467
Mode Shift Benefits for Commuters	10,488	89	0	20,055	0	9,610	82	0	20,941	0
Auto Delay Reductions for Commuters	11,253	0	0	27,815	0	12,558	0	0	35,326	0
Air Delay Reductions for Business Travelers	156,823	1,141	0	189,341	179	312,044	2,270	0	376,748	355
Air Delay Reductions for Non-Business Travelers	102,703	754	0	123,999	159	204,357	1,500	0	246,732	317
Air Delay Reductions for Operators	192,404	1,384	0	232,300	116	382,843	2,754	0	462,228	230

Table F.3 Traveler Benefit Details for the HST Palmdale Design Option (Thousands of 1996 Dollars)

	2020					2040				
	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State
Mode Shift Benefits for Intercity Business Travelers	615,253	154,830	94,012	1,128,567	180,849	1,218,801	303,281	183,444	2,222,713	358,003
Mode Shift Benefits for Intercity Non-Business Travelers	571,979	154,392	71,407	889,670	189,085	1,105,834	287,623	125,507	1,707,460	360,772
Auto Delay Reductions for Business Travelers	25,741	26,377	12,078	47,811	16,547	37,840	39,031	17,804	70,643	25,123
Auto Delay Reductions for Non-Business Travelers	38,294	26,588	15,415	64,950	21,924	56,308	39,381	22,808	96,125	33,858
Accident Reductions for Business Travelers	848	540	354	2,035	251	1,300	809	542	3,039	262
Accident Reductions for Non-Business Travelers	2,698	1,265	692	4,828	701	4,293	1,968	1,070	7,482	761
Air Pollution Reductions for Business Travelers	6,432	4,091	2,681	15,430	1,901	9,859	6,137	4,109	23,039	1,988
Air Pollution Reductions for Non-Business Travelers	20,454	9,590	5,245	36,606	5,312	32,554	14,922	8,110	56,732	5,771
Mode Shift Benefits for Commuters	8,940	76	0	21,616	0	8,206	70	0	22,357	0
Auto Delay Reductions for Commuters	11,253	0	0	34,810	0	12,558	0	0	43,728	0
Air Delay Reductions for Business Travelers	131,332	932	0	158,416	13	261,322	1,855	0	315,214	25
Air Delay Reductions for Non-Business Travelers	120,649	857	0	145,531	16	240,066	1,704	1	289,575	31
Air Delay Reductions for Operators	191,743	1,361	0	231,286	8	381,529	2,709	0	460,211	16

Table F.4 Traveler Benefit Details for the HST Diablo Direct Design Option (Thousands of 1996 Dollars)

	2020					2040				
	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State
Mode Shift Benefits for Intercity Business Travelers	654,474	165,519	95,787	1,180,403	187,343	1,289,908	321,636	186,703	2,318,023	369,950
Mode Shift Benefits for Intercity Non-Business Travelers	605,696	164,826	73,040	935,774	195,123	1,158,381	302,552	127,987	1,781,067	371,867
Auto Delay Reductions for Business Travelers	25,503	26,139	12,046	47,687	16,645	37,840	39,031	17,804	70,643	25,123
Auto Delay Reductions for Non-Business Travelers	38,294	26,588	15,415	64,950	21,924	56,308	39,381	22,808	96,125	33,858
Accident Reductions for Business Travelers	848	540	354	2,035	251	1,300	809	542	3,039	262
Accident Reductions for Non-Business Travelers	2,698	1,265	692	4,828	701	4,196	1,906	1,057	7,357	798
Air Pollution Reductions for Business Travelers	6,432	4,091	2,681	15,430	1,901	9,859	6,137	4,109	23,039	1,988
Air Pollution Reductions for Non-Business Travelers	20,454	9,590	5,245	36,606	5,312	31,816	14,451	8,012	55,780	6,054
Mode Shift Benefits for Commuters	10,488	89	0	20,055	0	9,610	82	0	20,941	0
Auto Delay Reductions for Commuters	11,253	0	0	27,815	0	12,558	0	0	35,326	0
Air Delay Reductions for Business Travelers	131,762	936	0	159,114	29	262,178	1,862	0	316,604	58
Air Delay Reductions for Non-Business Travelers	121,045	860	0	146,172	36	240,853	1,711	0	290,852	72
Air Delay Reductions for Operators	192,372	1,366	0	232,306	19	382,779	2,719	0	462,240	37

Table F.5 Traveler Benefit Details for the HST Irvine Design Option (Thousands of 1996 Dollars)

	2020					2040				
	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State	Bay Area	North Central Valley	South Central Valley	Southern CA	Rest of State
Mode Shift Benefits for Intercity Business Travelers	698,638	173,022	97,509	1,243,982	200,295	1,373,061	336,000	189,201	2,434,004	393,806
Mode Shift Benefits for Intercity Non-Business Travelers	625,448	163,315	65,266	953,024	200,933	1,192,075	308,687	129,526	1,831,208	382,269
Auto Delay Reductions for Business Travelers	25,477	26,200	11,948	47,207	16,439	37,840	39,031	17,804	70,643	25,123
Auto Delay Reductions for Non-Business Travelers	38,294	26,588	15,415	64,950	21,924	56,308	39,381	22,808	96,125	33,858
Accident Reductions for Business Travelers	848	540	354	2,035	251	1,300	809	542	3,039	262
Accident Reductions for Non-Business Travelers	2,698	1,265	692	4,828	701	4,040	1,849	1,012	7,001	677
Air Pollution Reductions for Business Travelers	6,432	4,091	2,681	15,430	1,901	9,859	6,137	4,109	23,039	1,988
Air Pollution Reductions for Non-Business Travelers	20,454	9,590	5,245	36,606	5,312	30,630	14,019	7,676	53,083	5,131
Mode Shift Benefits for Commuters	10,488	89	0	20,055	0	9,610	82	0	20,941	0
Auto Delay Reductions for Commuters	11,253	0	0	27,815	0	12,558	0	0	35,326	0
Air Delay Reductions for Business Travelers	130,619	926	0	157,535	12	259,905	1,842	0	313,461	23
Air Delay Reductions for Non-Business Travelers	122,393	867	0	147,614	15	243,537	1,726	0	293,721	30
Air Delay Reductions for Operators	192,823	1,366	0	232,557	8	383,677	2,719	0	462,739	15

Appendix G

Land Consumption Analysis for Employment

Appendix G. Land Consumption Analysis for Employment

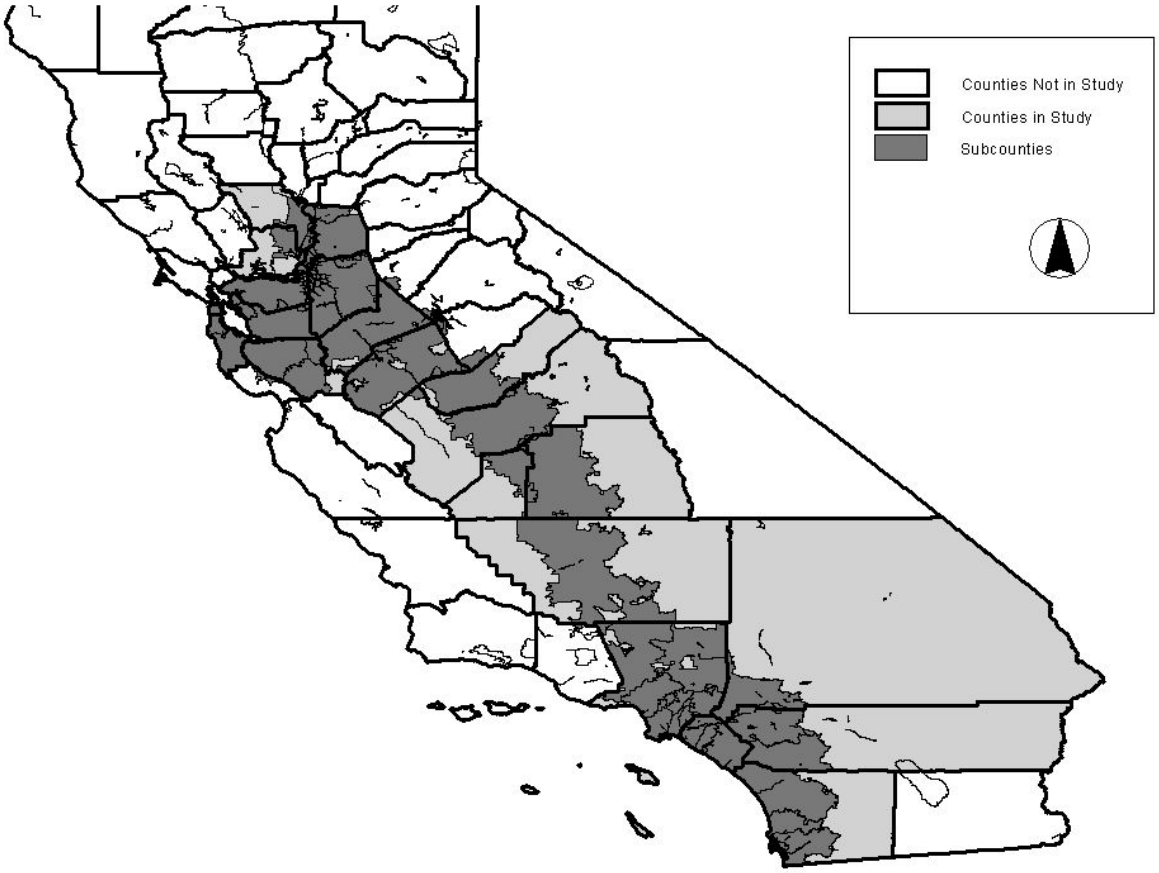
The analytical process for estimating employment-related land consumption consisted of three main steps including development of a database of current employment density for every ZIP code, allocation of forecast employment to segments of the urbanized area around each station, and tabulation of resulting land consumption.

The process began by classifying every ZIP code in the study area into subcounties associated with each station. Subcounties are the basic area of influence assumed for each station. Where no single design option proposes more than one station in a county, the area of influence generally consists of the entire county. Where multiple stations exist within a county, the county was divided along ZIP code boundaries into subcounties associated with each station. For large counties with boundaries that extend well beyond 25 miles from the proposed alignment, such as Riverside County which extends east to the Arizona border, only the portion of the county within the study area was used. By focusing on only those ZIP codes closest to the proposed HST alignment, the influence of development patterns typical of less densely populated portions of the State on the statistical analysis was minimized. Furthermore, the study area boundary concentrates development impacts of HST generally within 25 miles of the corridor, which leads to more reliable results. Figure G.1 shows the subcounties and the study area included in the analysis.

Each subcounty is associated with one "prototype" based on the position of a potential station within the HST system and the nature of existing development patterns in the subcounty. Prototypes included:

- Terminal (station at the end of a line in a major city downtown);
- Urban (through station in a small city downtown or other densely urbanized area);
- Suburban (through station in a lower density urbanized area);
- Urban-outlying (through station in a city independent of a major metropolitan area, such as in the Central Valley); and
- Rural (through station in a small rural community).

Figure G.1 Subcounties and Study Area



Each subcounty is further subdivided into three subregions. Subregions include:

- *Downtown* (traditional central business district);
- *Infill* (rest of currently urbanized area as defined by the U.S. Census); and
- *Other* (undeveloped land located outside of the currently urbanized area).

G.1 Disaggregation of Statewide and Regional Employment Forecasts

County-level employment forecasts by industry were allocated to subcounties based on the total current employment in the ZIP codes contained in each subcounty. These disaggregation factors were based on the number of establishments by size class and industry as reported by the U.S. Census in its 1997 ZIP Code Business Patterns (CBP) data, adjusted to 2002 county control totals as reported by W&P.

G.2 Development of Current Employment Density Profile

Employment density was calculated by industry for each ZIP code in the study area. Employment by ZIP was based on the CBP data. Employment land area was based on land use data provided by each jurisdiction in the study area. Existing land available for employment uses was derived from the calculations of land zoned for employment by one-digit SIC for each ZIP code. In counties for which no zoning data was available, the land available for each industry was calculated using average percentages of total land area available for each use.[1] Different averages were used for each prototype-subregion combination to better reflect local conditions.

Density profiles were developed for each of the 15 prototype-subregion combinations to represent the range of development patterns encountered across the study area. Densities are expressed as employees per acre of land zoned for employment in each industry. The profiles include densities in five percentile increments from the 0th to 100th. Table G.1 shows the median (50th percentile) density value for each industry and prototype-subregion combination.

The profile presents the range of densities encountered across the study area. Assumptions were made based on the review of domestic and international experience about how station area development would intensify over time. Major conclusions from the research translated into the following densification assumptions:

- Expected development intensity of new real estate investment is assumed to be 50th percentile (median) at present in all areas, with normal ongoing infill and refill increasing intensity to 55th and 60th percentile by 2020 and 2035, respectively, in downtown and infill areas. *Other* areas continue to develop at median intensity through 2035.

- The No-Project and Modal Alternatives have no further development intensification effect in downtown, infill, or other areas.

- The HST Alternative has no further intensification effect outside of the station influence area. While it has been assumed the influence area generally extends in a one-mile radius from a station, this distance can vary due to the ZIP code granularity of the analysis.

[1] In Fresno, Kings, and Madera Counties, the land available was computed based on statewide average shares of total land area by prototype and subregion. In Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, and Solano Counties, land available was computed based on statewide shares of total employment area by prototype and subregion using employment land area data provided by the Association of Bay Area Governments (ABAG). These averages were derived from the calculations by ZIP for the rest of the state.

Table G.1 Median Employment Density by Industry

Subregion	Number of ZIP Codes in Sample	Employment Density (Employees Per Acre)									
		Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government
Terminal											
Downtown	29	0	0	23	35	36	13	30	72	112	366
Infill	66	0	0	31	3	23	6	19	10	44	324
Other	9	0	0	1	0	0	2	4	2	11	0
Urban											
Downtown	32	0	0	68	35	14	13	20	63	62	405
Infill	430	0	0	42	17	9	9	20	32	36	240
Other	4	0	0	68	17	0	11	644	5	9	3
Suburban											
Downtown	0										
Infill	167	0	0	56	14	4	8	22	49	26	222
Other	16	0	0	15	0	1	0	6	4	16	23
Outlying											
Downtown	11	0	2	49	2	4	4	26	7	50	781
Infill	71	0	0	11	2	2	2	12	4	14	88
Other	12	0	0	10	1	4	1	3	1	1	247
Rural											
Downtown	0										
Infill	69	0	0	23	5	118	5	20	3	24	158
Other	18	0	0	0	2	109	11	4	0	5	194

Note: Development in suburban and rural downtowns is assumed to be the same as in their respective infill areas, because downtowns in these locations are generally not distinguishable from the rest of the urban area t the ZIP code level of geographic detail.

- Under regular market forces, the HST Alternative is assumed to have a relatively benign intensification effect in station influence area by 2020 (60th percentile), with a larger relative effect by 2035 (75th percentile) reflecting the development lag time.

- Experience elsewhere suggests that local and regional jurisdictions have an ability to further increase densities through reasonable land use regulation strategies when HST is present. For this analysis, it has been assumed that a land use regulation strategy would have a densification effect within the station influence area that would achieve the 2035 "market forces" effect by 2020 through development incentives intended to jump start development before or immediately following HST service introduction. Continued policy encouraging higher density, mixed use development creates a critical mass of station area activity by 2035 (90th percentile).

Table G.2 summarizes the development density gradient of each alternative throughout the station subcounty.

Table G.2 Density Gradient

Alternative	Percentile Value of Assumed Density for Subregion and Alternative			
	Station Area	Downtown Area	Infill Area	Other Area
2002 Existing Conditions	n/a	50	50	50
2020 No-Project	n/a	55	55	50
2035 No-Project	n/a	60	60	50
2020 Modal	n/a	55	55	50
2035 Modal	n/a	60	60	50
2020 HST (Market Trends)	55	55	55	50
2035 HST (Market Trends)	75	60	60	50
2020 HST (Regulation)	65	55	55	50
2035 HST (Regulation)	90	60	60	50

Note: For HST Alternatives, subregions are defined as the rest of the No-Project subregion that is not included in the station area.

G.3 Allocation of Employment to Subregions and Calculation of Land Requirements

Land consumption was computed for a subcounty by allocating future employment to each subregion in a step-wise fashion. For the No-Project and Modal Alternatives, a subcounty's forecasted employment was first allocated to the downtown area. The number of additional employees that could be accommodated in the downtown area is computed as the future carrying capacity of the subregion less the current employment in the subregion. The carrying capacity for each industry group is defined as the product of the acres of land available and the assumed employment density per acre based on the density gradient. If the current employment in the downtown area is greater than the assumed future carrying capacity, no additional employment was allocated. Any employment not accommodated in the downtown area was assumed to overflow to the infill area. The above process was then repeated for the infill area, with any remaining employment then assumed to overflow to the other area. The other area employment (by industry) was divided by the appropriate employment density values to arrive at a land consumption estimate for each subcounty, with results then aggregated to the county level.

The step-wise process was modified slightly for the HST Alternative, with employment allocation first occurring for the station influence area. If the station is located in the

downtown subregion, employment was next allocated to the rest of the downtown area, then to the infill area. If the station is located in the infill or other areas, employment was next allocated to the rest of the infill area, then to the downtown area. In both cases, any remaining employment was allocated to the other area, as occurred for the No-Project and Modal Alternatives.

G.4 Tabulation of Results

For this analysis, land consumption was defined as the increase in the acreage of land at urbanized densities in each county. This value is equal to the land acreage in other areas that is needed to accommodate growth in employment and population. The calculation of employment-related land consumption was described in the prior section, while the calculation of population-related values is described in Appendix H.

Appendix H

Land Consumption Analysis for Population

Appendix H. Land Consumption Analysis for Population

The allocation of population growth to various locations along the HST system and the prediction of land consumption resulting from residential construction on raw land were estimated using the California Urbanization and Biodiversity Analyst, or CURBA. CURBA is a spatial decision support system developed within the ESRI ArcGIS software package by the University of California at Berkeley's Institute of Urban and Regional Development.

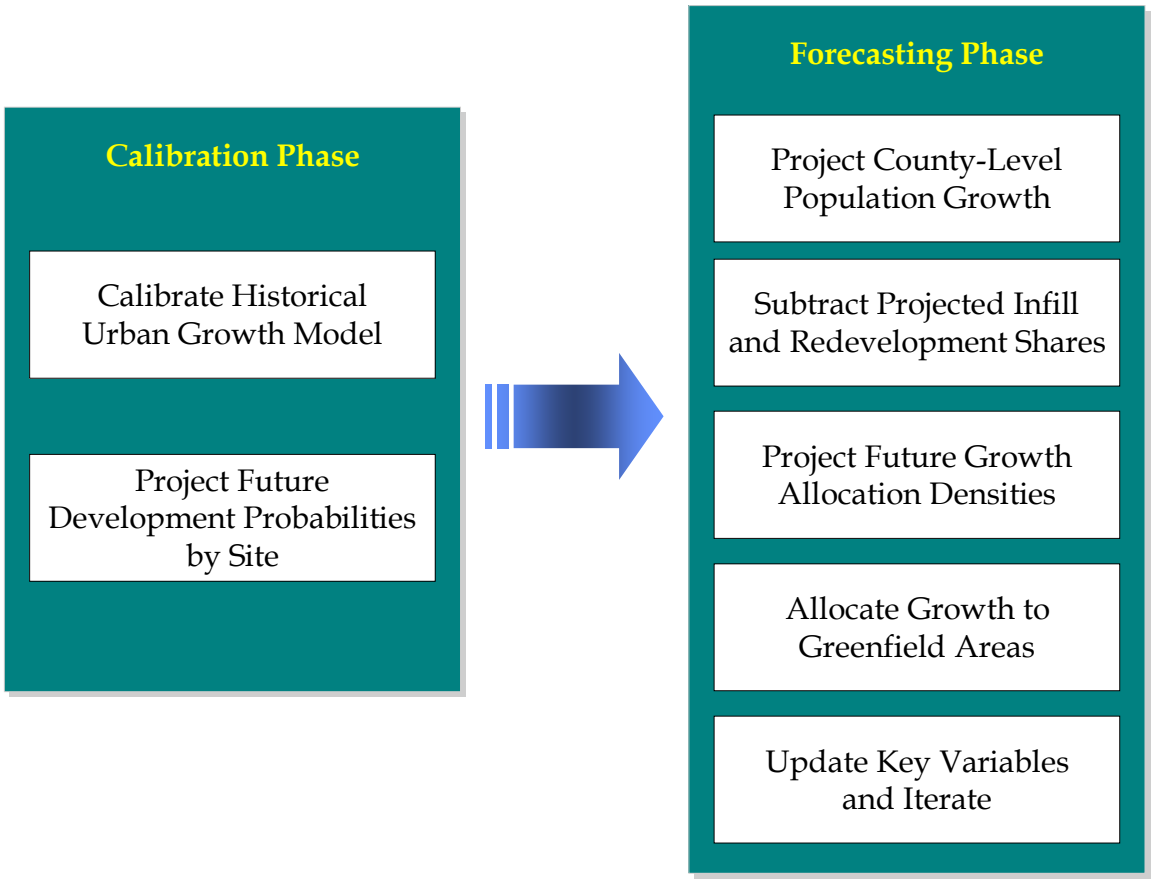
CURBA takes employment and population growth information and uses a number of historically-calibrated spatial statistical models to assign residential growth to various locations in and around the existing urban area. By modifying CURBA's employment distribution, infill allocation, and raw land development densities, the package was used to estimate the nature and amount of raw land consumption under the various alternatives. An overview of the CURBA forecasting methodology is illustrated in Figure H.1.

H.1 Calibration Phase

The model begins by calibrating a spatial-statistical model of historical development patterns (Step A). Land use change information was obtained from the California Farmland Mapping and Monitoring Program (CFMMP), a division of the California Department of Conservation. Through a combination of remote-sensing and local ground-truthing, the CFFMP conducts detailed bi-annual land cover inventories of urban development in 1988 and 1998. CFMMP data is generally accurate down to the one-hectare level.

The calibrated model parameters are then used with contemporary spatial data to generate a development probability surface describing the likelihood that particular undeveloped sites will subsequently be developed (Step B). Binomial logit models with four categories of independent variables were estimated using a maximum likelihood procedure. To better account for regional variations, four separate models were used, covering all counties in the HST study area. Categories of independent variables include:

Figure H.1 CURBA Forecasting Methodology



- Demand variables, which measure the demand for sites as a function of their accessibility to job opportunities and job growth, as well local income levels, such as the number of jobs within 90-minute travel time of a grid cell and the ratio of community median household income to county median household income;

- Own-site variables, which measure the physical and land use characteristics of each grid-cell as determinants of its development potential, such as the squared distance from each site to the nearest freeway, whether the site is classified as prime farmland by the CFMMP, the average percentage slope of each site, and whether the site falls within the FEMA-designated 100-year flood zone;

- Adjacency and neighborhood variables, which summarize the environmental and land use characteristics of adjacent and neighboring grid-cells, such as the average slope of the cells within near each subject site, and the share of sites near the subject site which are located in the FEMA 100-year flood zone; and

- Regulatory and administrative variables, which are intended to capture the development-encouraging or constraining effects of different land use policies and regulations, such as whether or not a site is located within an incorporated city.

H.2 Forecasting Phase

As shown in Figure H.1, the forecasting process included five distinct steps. The timing of development is predicted as a function of State and county population growth pressures (Step 1), the share of population accommodated through infill development (Step 2), and the density at which development occurs (Step 4). Projected population growth, net of infill, is then allocated to allowable development sites in order of their projected development probability (from Step B) at designated development densities. Once a future allocation has been completed (e.g., for the 2000-2020 period), infill rates, densities, and development probabilities are updated to reflect any intervening changes. The model is then run again (Steps 1 through 5) for subsequent periods. The county-level population forecasts were developed as part of an earlier phase of this overall project, and are described in Section 3.0 of the main report. Remaining steps are described in more detail below.

Infill and Redevelopment Shares

Projected infill and redevelopment shares were subtracted to reflect the fact that a significant share of projected population growth will occur within the existing urban footprint in the form of infill or redevelopment. Infill shares tend to rise over time as remaining undeveloped areas are used up and as developers reconsider previously passed-over infill lands. A cross-sectional regression model was developed relating current county infill shares to remaining supplies of undeveloped land. This model was then used to project future population shares in infill and currently undeveloped areas for the years 2020 and 2035.

Future Growth Allocation Densities

The amount of undeveloped land consumed by future population growth will depend both on the magnitude of growth and on its gross density. Marginal gross densities – that is the gross densities of new development – were estimated for each county by dividing the change in the population between 1988 and 1998 by the change in urbanized land area for the same period. Theory suggests that densities should rise as available supplies of undeveloped land are used up, as developers seek to use remaining lands more intensely. A cross-sectional regression model was developed relating marginal densities to remaining supplies of undeveloped land. This model was then used to project future allocation densities by county for the years 2020 and 2035. These county-specific estimates are then converted into hectare-specific densities using a rule set reflecting the manner in which

General Plans and zoning measures modify allowable densities of development in regards to regional location and natural factors.

Allocate Growth to Currently Undeveloped Areas

Remaining population growth was allocated to undeveloped sites in each region in order of development probability. Starting with the hectare-scale development probability scores derived above, a series of exclusion conditions are developed identifying which sites are to be precluded from development. Projected population growth (from Step 2) for the period 2000-2020 is then allocated to sites at projected densities (from Step 3) in order of development probability (from high to low), subject to any exclusion conditions.

Update and Reiterate

Key variables were updated to reflect projected employment growth and allocated population growth. Steps 4 and 5 were iterated for the period 2020-2035. Thanks to the analytical power of GIS, different forecasting steps could be undertaken at different spatial scale and then reconciled. Population growth, infill shares, and initial allocation densities, for example, were all identified and projected (Steps 1, 2, and 3) at the county level. Development probability scores and actual allocation densities, on the other hand, were estimated for individual one-hectare sites, accounting for differences among counties and regions. Employment projections, an input into the allocation procedure (Step 4) were developed for individual job centers. Distance to city boundaries, another input into the allocation procedure, were estimated and updated for incorporated cities.

H.3 Key Assumptions

Several assumptions are embedded in the employment and residential land requirements forecasting procedures and their components:

- The same factors that shaped land development patterns in the recent past will continue to do so in the future, and in the same ways. With the exception of the immediate area around HST stations, the employment forecasting procedure allocates future growth to subregions of each metropolitan area based on existing development patterns observed around the State and areas currently designated for employment uses. The residential forecasting procedure allocates future development to individual sites based on their projected development probability, which are estimated using the results of a statistical model calibrated for the period 1988 to 1998. While the exact role of particular factors varies by region, several influences are consistently important, including proximity to freeways, access to jobs, site slope, and site incorporation status. To the extent that these factors are less important in the future, or are important

in different ways – or, as is even more likely, that other factors become important – the model results will vary widely than what is presented here.

- Employment will continue decentralizing within California's four major urban regions – Southern California, the greater San Francisco Bay Area, the Sacramento region, and the southern San Joaquin Valley. Taking advantage of improved freeway access, less expensive land, and lower development costs, job growth during the last 50 years has favored suburban locations over core cities. To the extent that this trend continues – given the increasing importance of telecommunications in shaping economic geography, and in the absence of countervailing policies, there is no reason to believe that it should not – decentralizing job growth will continue to pull population outward, leading to more decentralized growth patterns.

- Average infill rates and population densities will increase with additional development. It is an axiom of economics that scarce resources are used more intensely than plentiful ones. Following this logic, as available supplies of developable land are used up, developers seek ways to use remaining land more intensely, either by increasing densities or through redevelopment. Thus, both development densities and infill activity should increase with population growth. Counteracting this tendency is the desire of many residents to preserve a rural or suburban lifestyle. Thus, there are many parts of California where infill activity and development densities are below what theory suggests they should be. For the purposes of analyzing all alternatives, it is assumed that future infill activity and development densities will continue to increase. To the extent that they do not, additional sites will be needed to accommodate projected population growth.

- With respect to the No-Project Scenario, it is assumed that no major changes in transportation accessibility (e.g., new freeways or transit lines, significant improvements in travel time, etc.) will occur. Although it is abundantly clear that California's growing population will need additional transportation infrastructure, it is unclear what the infrastructure should be, where it should go, and how it should be planned and financed. Lacking these specifics, and for the purposes of constructing a No-Project scenario, we assumed no change in transportation technology or facilities beyond what is currently available or included in the No-Project Alternative. The effect of this assumption is to direct additional growth largely to locations already served by transportation infrastructure rather than to new or different areas.

Appendix I

Employment Forecasts by Industry Sector

Appendix I. Employment Forecasts by Industry Sector

Table I.1 Employment Estimate by Industry Grouping
Year 2002 Existing Conditions

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	9,602	661	50,301	98,715	52,438	64,443	129,307	58,011	310,798	125,625	**899,901**
Contra Costa	10,567	2,424	34,148	26,328	24,801	16,164	78,218	58,784	185,465	46,913	**483,812**
San Francisco	2,643	776	24,460	32,962	43,703	22,777	104,321	102,623	341,792	95,542	**771,599**
San Mateo	9,310	353	25,688	39,743	47,938	24,968	76,627	48,959	196,249	31,877	**501,712**
Santa Clara	18,667	755	60,213	257,893	37,757	67,400	168,690	79,005	492,259	98,674	**1,281,313**
Solano	5,580	529	12,571	11,298	6,031	5,525	31,567	10,327	47,108	33,631	**164,167**
Bay Area	56,369	5,498	207,381	466,939	212,668	201,277	588,730	357,709	1,573,671	432,262	**4,102,504**
Madera	17,686	86	2,861	3,920	1,760	1,335	6,694	2,509	13,789	8,483	**59,123**
Merced	18,962	89	3,444	12,286	4,115	2,217	13,617	4,219	17,215	13,906	**90,070**
Sacramento	12,678	340	42,192	38,575	27,719	25,949	112,919	75,248	237,803	182,890	**756,313**
San Joaquin	29,714	224	15,015	26,157	16,981	11,248	41,999	18,233	72,141	36,613	**268,325**
Stanislaus	26,493	95	13,700	27,168	7,922	8,620	37,671	11,836	57,187	25,998	**216,690**
Yolo	8,357	268	5,390	7,461	7,447	8,636	17,780	6,266	25,477	26,744	**113,826**
No Central Valley	113,890	1,102	82,602	115,567	65,944	58,005	230,680	118,311	423,612	294,634	**1,504,347**
Fresno	79,213	566	21,279	29,963	16,955	17,025	63,079	29,115	108,154	63,653	**429,002**
Kern	59,494	9,646	17,077	11,470	14,201	10,190	45,852	16,933	79,102	58,809	**322,774**
Kings	10,486	14	1,757	3,451	1,196	1,203	7,028	1,821	9,165	15,168	**51,289**
Tulare	49,678	74	8,055	13,494	6,162	5,276	26,003	9,721	34,541	28,800	**181,804**
So Central Valley	198,871	10,300	48,168	58,378	38,514	33,694	141,962	57,590	230,962	166,430	**984,869**
Los Angeles	50,466	8,031	199,400	669,479	288,722	315,372	770,837	444,082	2,105,428	600,928	**5,452,745**
Orange	35,520	2,529	103,755	242,536	63,831	128,717	283,419	211,105	649,589	157,326	**1,878,327**
Riverside	37,502	894	63,140	58,176	20,201	21,930	113,559	46,580	202,538	92,319	**656,839**
San Bernardino	14,267	854	45,577	77,476	47,131	36,154	128,187	42,311	218,988	120,475	**731,420**
San Diego	43,774	1,564	98,024	141,726	66,961	63,629	261,345	146,399	622,069	309,131	**1,754,622**
So California	181,529	13,872	509,896	1,189,393	486,846	565,802	1,557,347	890,477	3,798,612	1,280,179	**10,473,953**
Rest of California	246,365	6,096	171,131	215,459	88,512	136,204	406,082	214,575	861,643	376,152	**2,722,219**
Statewide Total	**797,024**	**36,868**	**1,019,178**	**2,045,736**	**892,484**	**994,982**	**2,924,801**	**1,638,662**	**6,888,500**	**2,549,657**	**19,787,892**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.2 Employment Forecast by Industry Grouping

Year 2020 No-Project System Alternative

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	794	60,456	98,303	68,321	82,659	165,857	79,956	504,883	144,079	**1,212,510**
Contra Costa	10,127	2,901	40,864	27,236	28,955	19,075	92,306	76,097	328,597	63,231	**689,388**
San Francisco	3,965	896	28,253	27,153	31,888	25,509	116,832	96,007	434,576	103,761	**868,839**
San Mateo	9,310	443	32,265	44,681	60,144	28,494	87,449	51,978	263,181	33,029	**610,977**
Santa Clara	17,855	639	50,930	280,810	50,219	78,714	197,006	99,821	774,645	124,630	**1,675,268**
Solano	7,905	952	22,628	15,509	7,323	7,619	43,530	15,491	76,221	45,779	**242,957**
Bay Area	56,363	6,626	235,396	493,692	246,851	242,069	702,980	419,349	2,382,103	514,509	**5,299,940**
Madera	19,624	145	4,828	4,464	3,520	2,065	10,355	3,513	28,334	19,242	**96,090**
Merced	18,260	167	6,475	13,370	5,212	2,653	16,298	4,219	26,605	21,170	**114,429**
Sacramento	10,505	353	43,849	45,973	34,024	35,588	154,866	95,259	348,901	214,913	**984,230**
San Joaquin	29,157	280	18,797	28,976	29,629	21,397	79,896	26,359	119,896	57,729	**412,117**
Stanislaus	25,248	102	14,741	32,807	9,374	12,822	56,036	17,517	95,689	37,495	**301,832**
Yolo	9,551	295	5,940	7,585	9,738	11,181	23,019	5,771	38,216	39,471	**150,767**
No Central Valley	112,345	1,344	94,630	133,175	91,498	85,707	340,469	152,638	657,640	390,020	**2,059,465**
Fresno	86,563	819	30,779	36,645	24,094	22,886	84,795	39,355	165,325	111,462	**602,722**
Kern	53,420	10,773	19,072	13,914	18,766	14,275	64,233	18,789	138,237	101,773	**453,251**
Kings	13,262	16	2,027	3,660	1,367	1,203	7,028	2,601	13,828	21,652	**66,645**
Tulare	54,248	85	9,294	15,762	7,342	6,078	29,955	12,566	46,165	42,772	**224,268**
South Central Valley	207,493	11,693	61,172	69,981	51,568	44,442	186,011	73,312	363,555	277,659	**1,346,886**
Los Angeles	46,158	8,241	204,613	751,115	351,007	356,857	872,236	465,149	2,954,464	689,962	**6,699,802**
Orange	36,013	2,948	120,964	261,939	94,494	216,338	476,350	330,872	915,693	200,525	**2,656,136**
Riverside	34,672	1,262	89,146	85,807	28,503	44,430	230,070	52,181	362,073	148,522	**1,076,667**
San Bernardino	18,494	1,111	59,276	111,717	79,194	64,756	229,596	44,787	346,515	172,797	**1,128,243**
San Diego	41,386	1,952	122,330	162,706	90,164	94,580	388,471	188,024	1,075,600	441,195	**2,606,408**
South California	176,724	15,514	596,328	1,373,284	643,361	776,961	2,196,723	1,081,013	5,654,345	1,653,001	**14,167,255**
Rest of California	272,980	6,981	195,990	282,755	102,170	181,719	541,780	274,766	1,185,402	519,379	**3,563,921**
Statewide Total	**825,903**	**42,158**	**1,183,516**	**2,352,887**	**1,135,448**	**1,330,899**	**3,967,963**	**2,001,078**	**10,243,046**	**3,354,568**	**26,437,467**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.3 Employment Forecast by Industry Grouping

Year 2020 Modal System Alternative

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	799	60,807	98,803	69,219	83,003	166,548	80,287	506,907	144,208	**1,217,782**
Contra Costa	10,127	2,914	41,052	27,519	29,464	19,176	92,792	76,285	329,744	63,303	**692,375**
San Francisco	3,965	907	28,591	27,641	32,766	25,690	117,663	96,331	436,556	103,886	**873,995**
San Mateo	9,310	446	32,483	44,990	60,700	28,652	87,932	52,183	264,434	33,108	**614,240**
Santa Clara	17,855	646	51,508	281,631	51,695	79,199	198,221	100,365	777,972	124,841	**1,683,933**
Solano	7,905	956	22,712	15,632	7,544	7,657	43,747	15,572	76,720	45,811	**244,256**
Bay Area	56,363	6,668	237,154	496,215	251,389	243,376	706,903	421,022	2,392,333	515,156	**5,326,580**
Madera	19,624	146	4,849	4,490	3,546	2,077	10,414	3,540	28,442	19,253	**96,380**
Merced	18,260	169	6,534	13,441	5,284	2,681	16,467	4,294	26,908	21,200	**115,239**
Sacramento	10,505	356	44,156	46,332	34,387	35,775	155,679	95,640	350,436	215,064	**988,331**
San Joaquin	29,157	285	19,099	29,331	29,988	21,606	80,675	26,735	121,412	57,878	**416,166**
Stanislaus	25,248	103	14,879	32,968	9,538	12,906	56,401	17,688	96,379	37,563	**303,675**
Yolo	9,551	296	5,957	7,607	9,760	11,200	23,059	5,794	38,306	39,480	**151,010**
No Central Valley	112,345	1,355	95,476	134,169	92,502	86,245	342,696	153,691	661,885	390,439	**2,070,801**
Fresno	86,563	828	31,145	37,260	24,307	23,157	85,798	39,770	167,704	111,755	**608,287**
Kern	53,420	10,809	19,136	14,079	18,823	14,337	64,512	18,900	138,874	101,851	**454,741**
Kings	13,262	16	2,050	3,697	1,380	1,214	7,093	2,626	13,970	21,670	**66,977**
Tulare	54,248	86	9,315	15,797	7,354	6,090	30,016	12,590	46,301	42,789	**224,586**
South Central Valley	207,493	11,740	61,646	70,833	51,864	44,798	187,419	73,886	366,848	278,065	**1,354,590**
Los Angeles	46,158	8,370	207,817	756,171	354,772	360,218	880,450	467,613	2,971,441	691,410	**6,744,419**
Orange	36,013	2,986	122,517	264,352	96,291	218,064	480,150	332,048	923,796	201,217	**2,677,435**
Riverside	34,672	1,268	89,574	86,465	28,993	44,674	231,333	52,502	364,283	148,711	**1,082,474**
San Bernardino	18,494	1,118	59,653	112,301	79,628	65,050	230,638	45,071	348,475	172,964	**1,133,392**
San Diego	41,386	1,981	124,143	165,501	92,245	95,833	393,616	189,386	1,084,984	441,996	**2,631,070**
South California	176,724	15,723	603,703	1,384,790	651,929	783,838	2,216,187	1,086,620	5,692,978	1,656,297	**14,268,790**
Rest of California	272,980	7,001	195,070	280,998	101,574	179,925	540,023	274,400	1,181,648	519,131	**3,552,751**
Statewide Total	**825,903**	**42,487**	**1,193,049**	**2,367,005**	**1,149,258**	**1,338,183**	**3,993,228**	**2,009,618**	**10,295,693**	**3,359,088**	**26,573,512**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.4 Employment Forecast by Industry Grouping

Year 2020 High-Speed Train Alternative for Base and Outlying Station Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	802	61,067	99,093	69,419	83,200	166,944	80,523	508,282	144,431	**1,220,964**
Contra Costa	10,127	2,927	41,240	27,749	29,669	19,257	93,183	76,466	330,807	63,459	**694,884**
San Francisco	3,965	926	29,200	28,398	33,618	25,969	118,939	96,901	439,934	104,314	**882,165**
San Mateo	9,310	453	32,983	45,609	61,434	28,964	88,892	52,645	267,173	33,442	**620,905**
Santa Clara	17,855	656	52,318	282,602	52,709	79,768	199,645	101,107	782,354	125,427	**1,694,441**
Solano	7,905	960	22,823	15,769	7,684	7,699	43,986	15,677	77,339	45,895	**245,738**
Bay Area	56,363	6,726	239,630	499,220	254,533	244,857	711,591	423,318	2,405,890	516,967	**5,359,096**
Madera	19,624	146	4,872	4,502	3,547	2,088	10,468	3,622	28,678	19,268	**96,816**
Merced	18,260	175	6,758	13,613	5,387	2,775	17,046	4,922	28,812	21,339	**119,085**
Sacramento	10,505	365	45,335	47,224	34,924	36,427	158,516	98,886	360,292	215,783	**1,008,258**
San Joaquin	29,157	286	19,170	29,292	29,856	21,637	80,790	27,274	122,773	57,949	**418,184**
Stanislaus	25,248	105	15,119	33,124	9,603	13,034	56,963	18,437	98,580	37,716	**307,929**
Yolo	9,551	299	6,022	7,658	9,790	11,265	23,193	5,981	38,873	39,521	**152,155**
North Central Valley	112,345	1,377	97,276	135,412	93,107	87,227	346,976	159,122	678,008	391,576	**2,102,426**
Fresno	86,563	839	31,533	37,554	24,500	23,401	86,703	40,354	170,195	112,221	**613,863**
Kern	53,420	10,846	19,201	14,151	18,871	14,390	64,749	19,049	139,505	101,970	**456,151**
Kings	13,262	16	2,067	3,707	1,388	1,221	7,135	2,653	14,080	21,691	**67,222**
Tulare	54,248	86	9,333	15,808	7,362	6,099	30,057	12,617	46,412	42,811	**224,832**
South Central Valley	207,493	11,787	62,134	71,221	52,122	45,111	188,644	74,673	370,192	278,693	**1,362,068**
Los Angeles	46,158	8,393	208,400	757,389	355,776	360,740	881,727	468,513	2,975,422	692,142	**6,754,661**
Orange	36,013	2,979	122,211	263,973	96,040	217,692	479,332	331,962	922,486	201,232	**2,673,920**
Riverside	34,672	1,261	89,035	85,627	28,366	44,368	229,749	52,085	361,474	148,460	**1,075,097**
San Bernardino	18,494	1,132	60,404	113,548	80,586	65,614	232,641	45,768	352,632	173,434	**1,144,253**
San Diego	41,386	1,988	124,581	166,348	92,933	96,100	394,715	189,978	1,087,768	442,461	**2,638,258**
South California	176,724	15,753	604,631	1,386,886	653,701	784,515	2,218,164	1,088,307	5,699,781	1,657,727	**14,286,189**
Rest of California	272,980	7,044	196,878	283,275	102,233	180,770	543,527	274,566	1,185,239	520,499	**3,567,011**
Statewide Total	**825,903**	**42,686**	**1,200,550**	**2,376,014**	**1,155,696**	**1,342,480**	**4,008,902**	**2,019,986**	**10,339,111**	**3,365,463**	**26,676,791**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.5 Employment Forecast by Industry Grouping

Year 2020 High-Speed Train Alternative for Palmdale Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	802	61,031	99,040	69,376	83,167	166,877	80,490	508,077	144,411	**1,220,473**
Contra Costa	10,127	2,926	41,218	27,716	29,643	19,246	93,131	76,445	330,679	63,447	**694,577**
San Francisco	3,965	925	29,162	28,337	33,585	25,949	118,849	96,865	439,711	104,295	**881,642**
San Mateo	9,310	453	32,957	45,568	61,415	28,947	88,837	52,621	267,025	33,429	**620,561**
Santa Clara	17,855	655	52,264	282,517	52,665	79,725	199,537	101,057	782,046	125,400	**1,693,721**
Solano	7,905	960	22,814	15,755	7,675	7,695	43,964	15,668	77,286	45,890	**245,612**
Bay Area	56,363	6,721	239,447	498,932	254,358	244,728	711,196	423,145	2,404,823	516,871	**5,356,586**
Madera	19,624	146	4,871	4,502	3,547	2,088	10,468	3,621	28,676	19,267	**96,810**
Merced	18,260	174	6,751	13,606	5,381	2,774	17,035	4,906	28,779	21,332	**118,999**
Sacramento	10,505	365	45,307	47,198	34,901	36,421	158,487	98,824	360,184	215,754	**1,007,947**
San Joaquin	29,157	286	19,202	29,318	29,874	21,661	80,879	27,355	123,051	57,964	**418,748**
Stanislaus	25,248	105	15,112	33,118	9,597	13,033	56,957	18,424	98,558	37,709	**307,862**
Yolo	9,551	299	6,021	7,656	9,789	11,264	23,191	5,976	38,864	39,519	**152,131**
North Central Valley	112,345	1,377	97,265	135,399	93,089	87,240	347,017	159,106	678,113	391,547	**2,102,497**
Fresno	86,563	838	31,518	37,539	24,494	23,390	86,661	40,346	170,119	112,208	**613,678**
Kern	53,420	10,847	19,203	14,155	18,873	14,391	64,755	19,055	139,527	101,973	**456,199**
Kings	13,262	16	2,066	3,707	1,388	1,221	7,133	2,653	14,076	21,691	**67,212**
Tulare	54,248	86	9,321	15,794	7,356	6,092	30,026	12,602	46,337	42,799	**224,660**
South Central Valley	207,493	11,787	62,109	71,195	52,111	45,094	188,575	74,656	370,059	278,671	**1,361,750**
Los Angeles	46,158	8,387	208,239	757,082	355,634	360,569	881,308	468,364	2,974,427	692,057	**6,752,225**
Orange	36,013	2,977	122,150	263,862	95,985	217,625	479,182	331,908	922,124	201,200	**2,673,026**
Riverside	34,672	1,260	89,013	85,593	28,337	44,356	229,685	52,066	361,356	148,447	**1,074,783**
San Bernardino	18,494	1,131	60,386	113,507	80,581	65,599	232,587	45,751	352,502	173,426	**1,143,965**
San Diego	41,386	1,987	124,512	166,213	92,884	96,051	394,513	189,914	1,087,333	442,427	**2,637,220**
South California	176,724	15,743	604,301	1,386,257	653,421	784,199	2,217,275	1,088,002	5,697,742	1,657,556	**14,281,220**
Rest of California	272,980	7,041	196,807	283,203	102,204	180,761	543,370	274,517	1,185,012	520,441	**3,566,336**
Statewide Total	**825,903**	**42,669**	**1,199,927**	**2,374,986**	**1,155,184**	**1,342,022**	**4,007,434**	**2,019,426**	**10,335,750**	**3,365,087**	**26,668,389**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.6 Employment Forecast by Industry Grouping

Year 2020 High-Speed Train Alternative for Diablo Direct Design Option

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	803	61,079	99,105	69,448	83,210	166,964	80,535	508,346	144,441	**1,221,133**
Contra Costa	10,127	2,927	41,237	27,743	29,668	19,255	93,176	76,464	330,791	63,460	**694,848**
San Francisco	3,965	926	29,202	28,395	33,634	25,969	118,942	96,904	439,944	104,321	**882,201**
San Mateo	9,310	453	32,977	45,596	61,430	28,960	88,878	52,639	267,136	33,442	**620,822**
Santa Clara	17,855	655	52,248	282,502	52,597	79,713	199,508	101,043	781,957	125,394	**1,693,472**
Solano	7,905	960	22,823	15,767	7,686	7,698	43,985	15,677	77,337	45,896	**245,734**
Bay Area	56,363	6,725	239,567	499,108	254,463	244,806	711,452	423,261	2,405,510	516,954	**5,358,210**
Madera	19,624	147	4,877	4,506	3,550	2,090	10,481	3,634	28,716	19,271	**96,897**
Merced	18,260	175	6,761	13,615	5,389	2,777	17,058	4,929	28,844	21,342	**119,150**
Sacramento	10,505	365	45,347	47,232	34,931	36,437	158,557	98,908	360,398	215,793	**1,008,473**
San Joaquin	29,157	286	19,175	29,295	29,859	21,641	80,804	27,284	122,812	57,952	**418,264**
Stanislaus	25,248	105	15,115	33,121	9,600	13,033	56,956	18,427	98,555	37,715	**307,874**
Yolo	9,551	299	6,023	7,658	9,791	11,266	23,195	5,982	38,878	39,522	**152,164**
North Central Valley	112,345	1,377	97,297	135,427	93,120	87,244	347,051	159,163	678,204	391,595	**2,102,823**
Fresno	86,563	839	31,526	37,546	24,497	23,397	86,687	40,345	170,155	112,216	**613,770**
Kern	53,420	10,847	19,204	14,157	18,874	14,392	64,761	19,054	139,533	101,975	**456,217**
Kings	13,262	16	2,066	3,706	1,388	1,221	7,133	2,652	14,076	21,691	**67,212**
Tulare	54,248	86	9,333	15,807	7,362	6,098	30,056	12,616	46,409	42,810	**224,826**
South Central Valley	207,493	11,788	62,128	71,217	52,121	45,108	188,637	74,668	370,174	278,692	**1,362,025**
Los Angeles	46,158	8,392	208,357	757,298	355,737	360,695	881,617	468,474	2,975,163	692,131	**6,754,020**
Orange	36,013	2,978	122,192	263,936	96,022	217,672	479,286	331,946	922,378	201,226	**2,673,650**
Riverside	34,672	1,261	89,030	85,620	28,360	44,366	229,736	52,081	361,449	148,457	**1,075,031**
San Bernardino	18,494	1,132	60,400	113,535	80,585	65,611	232,628	45,764	352,602	173,435	**1,144,185**
San Diego	41,386	1,987	124,553	166,292	92,907	96,081	394,636	189,953	1,087,604	442,453	**2,637,851**
South California	176,724	15,750	604,531	1,386,681	653,611	784,424	2,217,902	1,088,218	5,699,195	1,657,701	**14,284,738**
Rest of California	272,980	7,043	196,847	283,238	102,217	180,755	543,449	274,536	1,185,087	520,473	**3,566,625**
Statewide Total	**825,903**	**42,683**	**1,200,370**	**2,375,671**	**1,155,532**	**1,342,337**	**4,008,491**	**2,019,846**	**10,338,170**	**3,365,416**	**26,674,420**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.7 Employment Forecast by Industry Grouping

Year 2020 High-Speed Train Alternative for East Bay Design Option

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	803	61,093	99,127	69,466	83,224	166,991	80,548	508,429	144,446	**1,221,329**
Contra Costa	10,127	2,927	41,240	27,749	29,669	19,257	93,183	76,466	330,807	63,459	**694,884**
San Francisco	3,965	926	29,184	28,377	33,590	25,961	118,905	96,886	439,846	104,305	**881,945**
San Mateo	9,310	453	32,967	45,589	61,406	28,954	88,861	52,630	267,086	33,433	**620,688**
Santa Clara	17,855	656	52,323	282,608	52,718	79,772	199,655	101,112	782,382	125,430	**1,694,512**
Solano	7,905	960	22,823	15,769	7,684	7,699	43,986	15,677	77,339	45,895	**245,738**
Bay Area	56,363	6,726	239,631	499,220	254,533	244,866	711,581	423,318	2,405,890	516,967	**5,359,096**
Madera	19,624	146	4,872	4,502	3,547	2,088	10,468	3,622	28,678	19,268	**96,816**
Merced	18,260	175	6,758	13,613	5,387	2,775	17,046	4,922	28,812	21,339	**119,085**
Sacramento	10,505	365	45,335	47,224	34,924	36,427	158,516	98,886	360,292	215,783	**1,008,258**
San Joaquin	29,157	286	19,170	29,292	29,856	21,637	80,790	27,274	122,773	57,949	**418,184**
Stanislaus	25,248	105	15,119	33,124	9,603	13,034	56,963	18,437	98,580	37,716	**307,929**
Yolo	9,551	299	6,022	7,658	9,790	11,265	23,193	5,981	38,873	39,521	**152,155**
North Central Valley	112,345	1,377	97,276	135,412	93,107	87,227	346,976	159,122	678,008	391,576	**2,102,426**
Fresno	86,563	839	31,533	37,554	24,500	23,401	86,703	40,354	170,195	112,221	**613,863**
Kern	53,420	10,846	19,201	14,151	18,871	14,390	64,749	19,049	139,505	101,970	**456,151**
Kings	13,262	16	2,067	3,707	1,388	1,221	7,135	2,653	14,080	21,691	**67,222**
Tulare	54,248	86	9,333	15,808	7,362	6,099	30,057	12,617	46,412	42,811	**224,832**
South Central Valley	207,493	11,787	62,134	71,221	52,122	45,111	188,644	74,673	370,192	278,693	**1,362,068**
Los Angeles	46,158	8,393	208,400	757,389	355,776	360,740	881,727	468,513	2,975,422	692,142	**6,754,661**
Orange	36,013	2,979	122,211	263,973	96,040	217,692	479,332	331,962	922,486	201,232	**2,673,920**
Riverside	34,672	1,261	89,035	85,627	28,366	44,368	229,749	52,085	361,474	148,460	**1,075,097**
San Bernardino	18,494	1,132	60,404	113,548	80,586	65,614	232,641	45,768	352,632	173,434	**1,144,253**
San Diego	41,386	1,988	124,581	166,348	92,933	96,100	394,715	189,978	1,087,768	442,461	**2,638,258**
South California	176,724	15,753	604,631	1,386,886	653,701	784,515	2,218,164	1,088,307	5,699,781	1,657,727	**14,286,189**
Rest of California	272,980	7,044	196,878	283,275	102,233	180,770	543,527	274,566	1,185,239	520,499	**3,567,011**
Statewide Total	**825,903**	**42,686**	**1,200,550**	**2,376,014**	**1,155,696**	**1,342,489**	**4,008,892**	**2,019,986**	**10,339,111**	**3,365,463**	**26,676,791**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.8 Employment Forecast by Industry Grouping

Year 2020 High-Speed Train Alternative for Irvine Design Option

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	7,202	803	61,080	99,127	69,466	83,208	166,960	80,529	508,336	144,426	**1,221,074**
Contra Costa	10,127	2,928	41,248	27,749	29,669	19,259	93,197	76,470	330,844	63,456	**694,959**
San Francisco	3,965	926	29,197	28,377	33,590	25,964	118,919	96,889	439,891	104,293	**882,020**
San Mateo	9,310	453	32,970	45,589	61,406	28,953	88,858	52,627	267,084	33,420	**620,655**
Santa Clara	17,855	656	52,319	282,608	52,718	79,762	199,631	101,096	782,322	125,400	**1,694,308**
Solano	7,905	961	22,826	15,769	7,684	7,699	43,989	15,678	77,348	45,892	**245,750**
Bay Area	56,363	6,727	239,640	499,220	254,533	244,847	711,553	423,288	2,405,824	516,887	**5,358,766**
Madera	19,624	146	4,873	4,502	3,547	2,088	10,470	3,623	28,683	19,268	**96,826**
Merced	18,260	175	6,758	13,613	5,387	2,775	17,044	4,918	28,805	21,336	**119,071**
Sacramento	10,505	366	45,357	47,224	34,924	36,439	158,565	98,919	360,428	215,782	**1,008,543**
San Joaquin	29,157	286	19,168	29,292	29,856	21,635	80,784	27,264	122,748	57,944	**418,130**
Stanislaus	25,248	105	15,117	33,124	9,603	13,033	56,957	18,428	98,558	37,712	**307,882**
Yolo	9,551	300	6,024	7,658	9,790	11,267	23,196	5,984	38,884	39,522	**152,178**
North Central Valley	112,345	1,377	97,296	135,412	93,107	87,237	347,017	159,135	678,106	391,564	**2,102,630**
Fresno	86,563	839	31,525	37,547	24,494	23,399	86,693	40,349	170,169	112,175	**613,751**
Kern	53,420	10,845	19,200	14,151	18,871	14,390	64,749	19,048	139,503	101,959	**456,135**
Kings	13,262	16	2,066	3,707	1,388	1,221	7,134	2,653	14,077	21,689	**67,213**
Tulare	54,248	86	9,332	15,808	7,362	6,098	30,056	12,616	46,409	42,808	**224,822**
South Central Valley	207,493	11,786	62,124	71,221	52,122	45,108	188,632	74,666	370,159	278,630	**1,361,921**
Los Angeles	46,158	8,389	208,297	757,389	355,776	360,623	881,441	468,403	2,974,801	692,013	**6,752,899**
Orange	36,013	2,984	122,414	263,973	96,040	217,908	479,808	332,133	923,575	201,320	**2,676,717**
Riverside	34,672	1,260	89,020	85,627	28,366	44,360	229,707	52,073	361,395	148,454	**1,074,894**
San Bernardino	18,494	1,132	60,398	113,548	80,586	65,607	232,613	45,757	352,580	173,409	**1,144,076**
San Diego	41,386	1,987	124,527	166,348	92,933	96,059	394,546	189,919	1,087,445	442,390	**2,637,334**
South California	176,724	15,752	604,656	1,386,886	653,701	784,557	2,218,115	1,088,285	5,699,796	1,657,585	**14,285,919**
Rest of California	272,980	7,044	196,892	283,267	102,231	180,771	543,536	274,562	1,185,276	520,445	**3,567,003**
Statewide Total	**825,903**	**42,686**	**1,200,607**	**2,376,006**	**1,155,694**	**1,342,519**	**4,008,853**	**2,019,936**	**10,339,162**	**3,365,112**	**26,676,240**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.9 Employment Forecast by Industry Grouping

Year 2035 No-Project System Alternative

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	738	56,138	110,141	67,309	76,987	154,477	76,359	565,793	159,422	**1,273,557**
Contra Costa	8,709	2,694	37,945	30,516	28,526	17,766	85,972	72,674	368,240	69,964	**723,006**
San Francisco	3,410	832	26,235	30,422	31,416	23,758	108,816	91,688	487,004	114,810	**918,391**
San Mateo	8,007	412	29,961	50,062	59,254	26,539	81,449	49,640	294,932	36,546	**636,802**
Santa Clara	15,356	593	47,293	314,624	49,475	73,313	183,488	95,330	868,099	137,902	**1,785,474**
Solano	6,799	884	21,012	17,377	7,215	7,096	40,543	14,794	85,417	50,654	**251,790**
Bay Area	48,474	6,152	218,584	553,141	243,195	225,460	654,746	400,484	2,669,485	569,298	**5,589,020**
Madera	71,729	139	4,628	5,176	3,436	2,026	10,161	3,694	34,001	14,762	**149,752**
Merced	66,742	160	6,206	15,501	5,088	2,604	15,992	4,437	31,927	16,241	**164,898**
Sacramento	38,396	339	42,031	53,301	33,209	34,922	151,965	100,172	418,694	164,873	**1,037,902**
San Joaquin	106,572	269	18,018	33,594	28,919	20,997	78,400	27,718	143,880	44,287	**502,655**
Stanislaus	92,286	98	14,130	38,036	9,150	12,582	54,986	18,421	114,831	28,765	**383,284**
Yolo	34,910	283	5,694	8,794	9,505	10,971	22,588	6,069	45,860	30,281	**174,955**
No Central Valley	410,635	1,288	90,708	154,403	89,307	84,102	334,091	160,509	789,193	299,209	**2,413,446**
Fresno	74,449	1,037	39,003	48,566	24,617	23,882	88,485	41,780	216,380	129,987	**688,186**
Kern	45,945	13,652	24,168	18,441	19,173	14,896	67,028	19,946	180,926	118,687	**522,862**
Kings	11,406	20	2,569	4,851	1,397	1,255	7,334	2,762	18,098	25,251	**74,942**
Tulare	46,656	108	11,778	20,890	7,501	6,342	31,259	13,340	60,422	49,881	**248,178**
So Central Valley	178,455	14,818	77,519	92,747	52,687	46,376	194,106	77,829	475,825	323,805	**1,534,168**
Los Angeles	39,698	8,039	199,587	859,696	353,835	348,926	852,850	476,675	3,487,381	779,723	**7,406,409**
Orange	30,973	2,876	117,992	299,805	95,255	211,530	465,763	339,071	1,080,862	226,613	**2,870,740**
Riverside	29,819	1,231	86,956	98,211	28,732	43,443	224,956	53,474	427,383	167,844	**1,162,051**
San Bernardino	15,906	1,083	57,820	127,867	79,832	63,316	224,493	45,896	409,019	195,278	**1,220,510**
San Diego	35,594	1,904	119,325	186,227	90,890	92,478	379,837	192,683	1,269,613	498,593	**2,867,144**
So California	151,991	15,133	581,680	1,571,806	648,545	759,692	2,147,899	1,107,800	6,674,258	1,868,052	**15,526,855**
Rest of CA	234,778	6,981	195,990	323,751	106,453	175,554	523,398	280,041	1,394,589	578,718	**3,809,552**
Statewide Total	**1,024,333**	**44,373**	**1,164,480**	**2,695,850**	**1,140,186**	**1,291,184**	**3,854,241**	**2,026,664**	**12,003,351**	**3,639,082**	**28,873,042**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.10 Employment Forecast by Industry Grouping

Year 2035 Modal System Alternative

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	743	56,542	111,039	68,762	77,466	155,439	76,882	569,016	160,003	**1,282,085**
Contra Costa	8,709	2,709	38,163	31,027	29,353	17,907	86,652	72,972	370,076	70,294	**727,862**
San Francisco	3,410	845	26,619	31,293	32,823	24,008	109,961	92,195	490,127	115,372	**926,652**
San Mateo	8,007	415	30,210	50,616	60,149	26,758	82,120	49,963	296,920	36,904	**642,062**
Santa Clara	15,356	601	47,955	316,098	51,858	73,987	185,177	96,188	873,387	138,854	**1,799,462**
Solano	6,799	888	21,109	17,599	7,574	7,149	40,847	14,923	86,215	50,798	**253,901**
Bay Area	48,474	6,201	220,597	557,672	250,519	227,276	660,196	403,123	2,685,740	572,225	**5,632,024**
Madera	71,729	140	4,671	5,242	3,500	2,055	10,303	3,763	34,270	14,848	**150,520**
Merced	66,742	164	6,327	15,685	5,268	2,670	16,402	4,630	32,678	16,483	**167,050**
Sacramento	38,396	344	42,653	54,230	34,123	35,371	153,920	101,150	422,489	166,095	**1,048,771**
San Joaquin	106,572	278	18,656	34,554	29,863	21,521	80,358	28,728	147,797	45,549	**513,877**
Stanislaus	92,286	100	14,405	38,446	9,553	12,780	55,849	18,852	116,505	29,304	**388,080**
Yolo	34,910	285	5,729	8,849	9,559	11,017	22,683	6,127	46,083	30,353	**175,594**
No Central Valley	410,635	1,311	92,441	157,006	91,867	85,414	339,514	163,249	799,822	302,633	**2,443,892**
Fresno	74,449	1,055	39,668	49,731	24,968	24,314	90,086	42,501	220,729	131,266	**698,767**
Kern	45,945	13,725	24,299	18,789	19,278	15,007	67,525	20,162	182,225	119,069	**526,022**
Kings	11,406	21	2,608	4,918	1,417	1,273	7,434	2,803	18,350	25,325	**75,555**
Tulare	46,656	109	11,818	20,958	7,522	6,363	31,359	13,383	60,678	49,956	**248,800**
So Central Valley	178,455	14,910	78,393	94,397	53,184	46,956	196,404	78,849	481,982	325,615	**1,549,145**
Los Angeles	39,698	8,199	203,562	868,940	360,848	353,792	864,744	480,876	3,515,768	786,008	**7,482,434**
Orange	30,973	2,923	119,901	304,175	98,571	214,005	471,213	341,057	1,094,285	229,585	**2,906,688**
Riverside	29,819	1,239	87,495	99,433	29,659	43,801	226,813	54,030	431,135	168,675	**1,172,098**
San Bernardino	15,906	1,092	58,294	128,947	80,651	63,747	226,021	46,387	412,335	196,012	**1,229,392**
San Diego	35,594	1,940	121,591	191,373	94,795	94,305	387,341	195,023	1,285,418	502,092	**2,909,471**
So California	151,991	15,392	590,842	1,592,868	664,525	769,650	2,176,131	1,117,373	6,738,941	1,882,372	**15,700,084**
Rest of CA	234,778	7,041	194,937	320,898	105,569	173,072	521,139	279,585	1,388,881	578,121	**3,793,320**
Statewide Total	**1,024,333**	**44,855**	**1,177,209**	**2,722,842**	**1,165,664**	**1,302,368**	**3,893,384**	**2,042,179**	**12,095,366**	**3,660,965**	**29,118,465**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.11 Employment Forecast by Industry Grouping

Year 2035 High-Speed Train Alternative for Base and Outlying Station Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	747	56,828	111,641	69,179	77,739	155,987	77,280	571,308	160,595	**1,287,498**
Contra Costa	8,709	2,724	38,376	31,505	29,758	18,022	87,208	73,281	371,875	70,737	**732,194**
San Francisco	3,410	866	27,282	32,741	34,304	24,385	111,684	93,110	495,525	116,622	**939,928**
San Mateo	8,007	422	30,744	51,766	61,377	27,171	83,387	50,686	301,197	37,879	**652,637**
Santa Clara	15,356	612	48,835	317,976	53,651	74,755	187,098	97,387	880,419	140,522	**1,816,613**
Solano	6,799	894	21,235	17,875	7,836	7,208	41,183	15,100	87,249	51,044	**256,421**
Bay Area	48,474	6,265	223,300	563,504	256,105	229,280	666,547	406,844	2,707,573	577,399	**5,685,292**
Madera	71,729	141	4,688	5,255	3,488	2,066	10,360	3,945	34,738	14,895	**151,305**
Merced	66,742	170	6,595	16,006	5,422	2,818	17,311	6,052	36,655	17,099	**174,870**
Sacramento	38,396	358	44,393	56,317	35,208	36,633	159,412	109,820	446,939	169,998	**1,097,473**
San Joaquin	106,572	278	18,624	34,373	29,435	21,496	80,265	30,209	151,173	45,611	**518,037**
Stanislaus	92,286	102	14,713	38,779	9,642	13,002	56,823	20,799	121,791	30,028	**397,966**
Yolo	34,910	290	5,823	8,966	9,619	11,141	22,938	6,618	47,467	30,572	**178,343**
No Central Valley	410,635	1,338	94,835	159,696	92,814	87,158	347,108	177,443	838,763	308,203	**2,517,994**
Fresno	74,449	1,072	40,300	50,429	25,308	24,692	91,485	43,523	225,427	132,839	**709,524**
Kern	45,945	13,782	24,400	18,948	19,361	15,084	67,875	20,420	183,384	119,462	**528,661**
Kings	11,406	21	2,631	4,938	1,429	1,282	7,487	2,844	18,523	25,385	**75,945**
Tulare	46,656	109	11,841	20,979	7,535	6,373	31,412	13,424	60,857	50,018	**249,205**
So Central Valley	178,455	14,984	79,172	95,294	53,632	47,431	198,259	80,211	488,191	327,704	**1,563,334**
Los Angeles	39,698	8,228	204,300	871,801	362,801	354,648	866,835	482,586	3,523,439	788,435	**7,502,773**
Orange	30,973	2,913	119,515	303,656	98,108	213,488	470,075	340,951	1,092,334	229,385	**2,901,398**
Riverside	29,819	1,232	87,029	98,393	28,867	43,491	225,205	53,563	427,925	167,975	**1,163,500**
San Bernardino	15,906	1,107	59,076	131,026	82,172	64,448	228,505	47,439	418,428	197,551	**1,245,657**
San Diego	35,594	1,947	122,041	193,039	95,937	94,649	388,756	196,010	1,289,906	503,496	**2,921,375**
So California	151,991	15,428	591,960	1,597,916	667,885	770,724	2,179,376	1,120,550	6,752,033	1,886,842	**15,734,703**
Rest of CA	234,778	7,127	197,278	325,155	106,779	174,179	526,436	279,179	1,393,265	582,547	**3,816,023**
Statewide Total	**1,024,333**	**45,142**	**1,186,545**	**2,741,565**	**1,177,215**	**1,308,771**	**3,917,726**	**2,064,227**	**12,179,826**	**3,682,695**	**29,317,346**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.12 Employment Forecast by Industry Grouping

Year 2035 High-Speed Train Alternative for Train Alternative for Palmdale Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	746	56,794	111,553	69,119	77,699	155,906	77,234	571,019	160,540	**1,286,805**
Contra Costa	8,709	2,723	38,356	31,450	29,724	18,009	87,147	73,253	371,699	70,704	**731,774**
San Francisco	3,410	864	27,241	32,627	34,242	24,357	111,560	93,054	495,165	116,556	**939,076**
San Mateo	8,007	422	30,717	51,690	61,340	27,146	83,311	50,649	300,957	37,835	**652,073**
Santa Clara	15,356	612	48,780	317,824	53,575	74,697	186,954	97,312	879,938	140,435	**1,815,482**
Solano	6,799	893	21,226	17,852	7,824	7,203	41,157	15,088	87,176	51,030	**256,249**
Bay Area	48,474	6,260	223,114	562,996	255,825	229,112	666,033	406,589	2,705,954	577,100	**5,681,459**
Madera	71,729	141	4,688	5,255	3,487	2,067	10,363	3,945	34,744	14,894	**151,314**
Merced	66,742	170	6,583	15,991	5,409	2,815	17,291	6,004	36,556	17,068	**174,629**
Sacramento	38,396	357	44,364	56,278	35,167	36,638	159,435	109,708	446,854	169,902	**1,097,099**
San Joaquin	106,572	279	18,672	34,435	29,472	21,544	80,444	30,409	151,827	45,707	**519,361**
Stanislaus	92,286	102	14,700	38,762	9,627	12,999	56,810	20,747	121,700	29,992	**397,725**
Yolo	34,910	289	5,821	8,963	9,616	11,141	22,938	6,610	47,457	30,566	**178,311**
No Central Valley	410,635	1,338	94,827	159,684	92,779	87,205	347,280	177,423	839,139	308,128	**2,518,438**
Fresno	74,449	1,071	40,268	50,393	25,297	24,672	91,414	43,502	225,260	132,780	**709,107**
Kern	45,945	13,785	24,405	18,961	19,366	15,089	67,894	20,436	183,452	119,482	**528,814**
Kings	11,406	21	2,629	4,935	1,428	1,280	7,481	2,841	18,509	25,380	**75,910**
Tulare	46,656	109	11,823	20,953	7,525	6,364	31,367	13,401	60,732	49,978	**248,909**
So Central Valley	178,455	14,986	79,124	95,242	53,617	47,406	198,155	80,181	487,953	327,620	**1,562,740**
Los Angeles	39,698	8,221	204,121	871,250	362,559	354,414	866,264	482,343	3,521,854	788,114	**7,498,839**
Orange	30,973	2,911	119,447	303,455	98,011	213,395	469,869	340,861	1,091,752	229,264	**2,899,938**
Riverside	29,819	1,232	87,005	98,332	28,824	43,475	225,123	53,534	427,745	167,932	**1,163,021**
San Bernardino	15,906	1,107	59,056	130,952	82,161	64,427	228,430	47,410	418,224	197,518	**1,245,192**
San Diego	35,594	1,946	121,952	192,767	95,829	94,573	388,441	195,892	1,289,127	503,343	**2,919,464**
So California	151,991	15,417	591,581	1,596,756	667,385	770,283	2,178,127	1,120,040	6,748,703	1,886,172	**15,726,454**
Rest of CA	234,778	7,121	197,186	325,000	106,723	174,149	526,170	279,089	1,392,796	582,333	**3,814,643**
Statewide Total	**1,024,333**	**45,123**	**1,185,832**	**2,739,678**	**1,176,328**	**1,308,155**	**3,915,767**	**2,063,322**	**12,174,545**	**3,681,353**	**29,303,735**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.13 Employment Forecast by Industry Grouping

Year 2035 High-Speed Train Alternative for Diablo Direct Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	747	56,842	111,662	69,224	77,752	156,012	77,298	571,405	160,626	**1,287,762**
Contra Costa	8,709	2,724	38,375	31,497	29,761	18,021	87,202	73,280	371,861	70,740	**732,172**
San Francisco	3,410	866	27,288	32,739	34,331	24,386	111,691	93,118	495,550	116,642	**940,022**
San Mateo	8,007	422	30,739	51,746	61,372	27,165	83,369	50,679	301,142	37,878	**652,520**
Santa Clara	15,356	611	48,768	317,811	53,485	74,688	186,931	97,297	879,853	140,422	**1,815,223**
Solano	6,799	894	21,236	17,874	7,841	7,208	41,183	15,101	87,251	51,047	**256,433**
Bay Area	48,474	6,264	223,248	563,329	256,015	229,220	666,389	406,773	2,707,062	577,355	**5,684,131**
Madera	71,729	141	4,697	5,266	3,495	2,072	10,390	3,982	34,847	14,915	**151,534**
Merced	66,742	171	6,600	16,012	5,426	2,822	17,335	6,071	36,727	17,110	**175,016**
Sacramento	38,396	358	44,416	56,345	35,225	36,660	159,528	109,905	447,284	170,047	**1,098,163**
San Joaquin	106,572	278	18,627	34,376	29,437	21,501	80,284	30,218	151,224	45,616	**518,134**
Stanislaus	92,286	102	14,703	38,766	9,634	12,998	56,802	20,756	121,691	30,006	**397,744**
Yolo	34,910	290	5,824	8,967	9,620	11,144	22,943	6,621	47,482	30,574	**178,374**
No Central Valley	410,635	1,339	94,866	159,733	92,837	87,197	347,282	177,553	839,255	308,268	**2,518,965**
Fresno	74,449	1,071	40,283	50,409	25,302	24,684	91,455	43,504	225,333	132,812	**709,302**
Kern	45,945	13,786	24,407	18,965	19,368	15,091	67,905	20,436	183,471	119,490	**528,865**
Kings	11,406	21	2,629	4,935	1,428	1,281	7,481	2,841	18,508	25,380	**75,908**
Tulare	46,656	109	11,840	20,978	7,534	6,373	31,410	13,423	60,852	50,016	**249,191**
So Central Valley	178,455	14,988	79,159	95,287	53,632	47,428	198,251	80,204	488,163	327,698	**1,563,266**
Los Angeles	39,698	8,227	204,264	871,668	362,758	354,604	866,728	482,540	3,523,127	788,414	**7,502,027**
Orange	30,973	2,913	119,494	303,589	98,075	213,460	470,014	340,925	1,092,161	229,360	**2,900,964**
Riverside	29,819	1,232	87,026	98,385	28,862	43,489	225,195	53,560	427,902	167,971	**1,163,441**
San Bernardino	15,906	1,107	59,071	131,004	82,170	64,444	228,490	47,433	418,385	197,555	**1,245,565**
San Diego	35,594	1,947	122,002	192,920	95,879	94,619	388,630	195,963	1,289,599	503,452	**2,920,604**
So California	151,991	15,425	591,857	1,597,566	667,745	770,615	2,179,056	1,120,420	6,751,175	1,886,752	**15,732,601**
Rest of CA	234,778	7,125	197,244	325,085	106,750	174,154	526,317	279,125	1,392,983	582,465	**3,815,325**
Statewide Total	**1,024,333**	**45,141**	**1,186,374**	**2,741,001**	**1,176,978**	**1,308,614**	**3,917,296**	**2,064,075**	**12,178,640**	**3,682,538**	**29,314,289**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.14 Employment Forecast by Industry Grouping

Year 2035 High-Speed Train Alternative for East Bay Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	747	56,846	111,681	69,228	77,759	156,026	77,304	571,453	160,626	**1,287,863**
Contra Costa	8,709	2,724	38,376	31,505	29,758	18,022	87,208	73,281	371,875	70,737	**732,194**
San Francisco	3,410	865	27,272	32,717	34,274	24,378	111,655	93,096	495,438	116,604	**939,709**
San Mateo	8,007	422	30,734	51,743	61,348	27,162	83,361	50,672	301,111	37,861	**652,421**
Santa Clara	15,356	612	48,839	317,984	53,661	74,758	187,107	97,392	880,447	140,528	**1,816,684**
Solano	6,799	894	21,235	17,875	7,836	7,208	41,183	15,100	87,249	51,044	**256,421**
Bay Area	48,474	6,265	223,301	563,504	256,105	229,288	666,539	406,844	2,707,573	577,399	**5,685,292**
Madera	71,729	141	4,688	5,255	3,488	2,066	10,360	3,945	34,738	14,895	**151,305**
Merced	66,742	170	6,595	16,006	5,422	2,818	17,311	6,052	36,655	17,099	**174,870**
Sacramento	38,396	358	44,393	56,317	35,208	36,633	159,412	109,820	446,939	169,998	**1,097,473**
San Joaquin	106,572	278	18,624	34,373	29,435	21,496	80,265	30,209	151,173	45,611	**518,037**
Stanislaus	92,286	102	14,713	38,779	9,642	13,002	56,823	20,799	121,791	30,028	**397,966**
Yolo	34,910	290	5,823	8,966	9,619	11,141	22,938	6,618	47,467	30,572	**178,343**
No Central Valley	410,635	1,338	94,835	159,696	92,814	87,158	347,108	177,443	838,763	308,203	**2,517,994**
Fresno	74,449	1,072	40,300	50,429	25,308	24,692	91,485	43,523	225,427	132,839	**709,524**
Kern	45,945	13,782	24,400	18,948	19,361	15,084	67,875	20,420	183,384	119,462	**528,661**
Kings	11,406	21	2,631	4,938	1,429	1,282	7,487	2,844	18,523	25,385	**75,945**
Tulare	46,656	109	11,841	20,979	7,535	6,373	31,412	13,424	60,857	50,018	**249,205**
So Central Valley	178,455	14,984	79,172	95,294	53,632	47,431	198,259	80,211	488,191	327,704	**1,563,334**
Los Angeles	39,698	8,228	204,300	871,801	362,801	354,648	866,835	482,586	3,523,439	788,435	**7,502,773**
Orange	30,973	2,913	119,515	303,656	98,108	213,488	470,075	340,951	1,092,334	229,385	**2,901,398**
Riverside	29,819	1,232	87,029	98,393	28,867	43,491	225,205	53,563	427,925	167,975	**1,163,500**
San Bernardino	15,906	1,107	59,076	131,026	82,172	64,448	228,505	47,439	418,428	197,551	**1,245,657**
San Diego	35,594	1,947	122,041	193,039	95,937	94,649	388,756	196,010	1,289,906	503,496	**2,921,375**
So California	151,991	15,428	591,960	1,597,916	667,885	770,724	2,179,376	1,120,550	6,752,033	1,886,842	**15,734,703**
Rest of CA	234,778	7,127	197,278	325,155	106,779	174,179	526,436	279,179	1,393,265	582,547	**3,816,023**
Statewide Total	**1,024,333**	**45,142**	**1,186,546**	**2,741,565**	**1,177,215**	**1,308,779**	**3,917,718**	**2,064,227**	**12,179,826**	**3,682,695**	**29,317,346**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Table I.15 Employment Forecast by Industry Grouping

Year 2035 High-Speed Train Alternative for Irvine Design Options

County	Farming	Mining	Construction	Manufacturing	TCU	Wholesale	Retail	FIRE	Services	Government	Total
Alameda	6,193	747	56,848	111,679	69,218	77,758	156,024	77,303	571,440	160,631	**1,287,842**
Contra Costa	8,709	2,725	38,392	31,538	29,795	18,030	87,248	73,301	371,993	70,767	**732,498**
San Francisco	3,410	866	27,292	32,753	34,307	24,387	111,697	93,117	495,558	116,641	**940,028**
San Mateo	8,007	422	30,740	51,751	61,348	27,164	83,367	50,676	301,129	37,873	**652,477**
Santa Clara	15,356	613	48,851	317,997	53,660	74,763	187,118	97,398	880,477	140,551	**1,816,784**
Solano	6,799	894	21,240	17,886	7,847	7,210	41,196	15,106	87,286	51,054	**256,519**
Bay Area	48,474	6,267	223,364	563,604	256,175	229,313	666,651	406,900	2,707,884	577,517	**5,686,149**
Madera	71,729	141	4,690	5,258	3,490	2,067	10,367	3,953	34,760	14,900	**151,354**
Merced	66,742	170	6,593	16,006	5,422	2,817	17,305	6,038	36,621	17,096	**174,810**
Sacramento	38,396	358	44,434	56,380	35,249	36,662	159,536	109,941	447,331	170,090	**1,098,376**
San Joaquin	106,572	278	18,616	34,365	29,430	21,489	80,238	30,163	151,048	45,593	**517,793**
Stanislaus	92,286	102	14,706	38,773	9,638	12,997	56,801	20,761	121,690	30,015	**397,770**
Yolo	34,910	290	5,826	8,970	9,622	11,145	22,946	6,627	47,496	30,579	**178,410**
No Central Valley	410,635	1,339	94,865	159,752	92,850	87,178	347,192	177,483	838,946	308,273	**2,518,513**
Fresno	74,449	1,072	40,298	50,425	25,305	24,689	91,473	43,514	225,388	132,793	**709,404**
Kern	45,945	13,787	24,408	18,964	19,366	15,090	67,902	20,434	183,461	119,477	**528,834**
Kings	11,406	21	2,629	4,936	1,428	1,281	7,482	2,841	18,509	25,378	**75,909**
Tulare	46,656	109	11,841	20,978	7,534	6,373	31,409	13,423	60,851	50,015	**249,188**
So Central Valley	178,455	14,988	79,175	95,302	53,633	47,432	198,266	80,212	488,208	327,662	**1,563,335**
Los Angeles	39,698	8,225	204,215	871,562	362,590	354,529	866,545	482,459	3,522,684	788,285	**7,500,791**
Orange	30,973	2,920	119,789	304,340	98,602	213,834	470,836	341,282	1,094,357	229,885	**2,906,817**
Riverside	29,819	1,232	87,020	98,370	28,849	43,484	225,173	53,552	427,855	167,959	**1,163,312**
San Bernardino	15,906	1,107	59,069	131,004	82,147	64,439	228,474	47,426	418,353	197,541	**1,245,466**
San Diego	35,594	1,946	121,970	192,850	95,777	94,587	388,499	195,912	1,289,318	503,372	**2,919,824**
So California	151,991	15,430	592,062	1,598,126	667,965	770,873	2,179,526	1,120,630	6,752,566	1,887,042	**15,736,209**
Rest of CA	234,778	7,130	197,317	325,210	106,799	174,189	526,523	279,213	1,393,437	582,601	**3,816,495**
Statewide Total	**1,024,333**	**45,154**	**1,186,783**	**2,741,995**	**1,177,422**	**1,308,985**	**3,918,157**	**2,064,438**	**12,181,042**	**3,683,095**	**29,320,702**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative. Other counties are included in "rest of state" grouping.

Appendix J

Employment Allocation Within Counties

Appendix J. Employment Allocation Within Counties

Table J.1 Employment Allocation by Subregion
Year 2020

County	Percentage of Total County Employment by Subregion							
	No-Project Alternative				Modal Alternatives			
	Station Area	Downtown Area	Infill Area	Other Area	Station Area	Downtown Area	Infill Area	Other Area
Alameda	-	-	84%	16%	-	-	84%	16%
Contra Costa	-	-	76%	24%	-	-	76%	24%
San Francisco	-	53%	33%	14%	-	53%	33%	14%
San Mateo	-	4%	82%	14%	-	4%	81%	14%
Santa Clara	-	19%	63%	19%	-	19%	62%	19%
Solano	-	-	82%	18%	-	-	78%	22%
Bay Area*	-	16%	67%	17%	-	16%	67%	18%
Madera	-	-	82%	18%	-	-	82%	18%
Merced	-	-	99%	1%	-	-	99%	1%
Sacramento	-	23%	60%	17%	-	23%	60%	17%
San Joaquin	-	-	84%	16%	-	-	84%	16%
Stanislaus	-	-	71%	29%	-	-	70%	30%
Yolo	-	-	79%	21%	-	-	79%	21%
North Central Valley*	-	11%	71%	18%	-	11%	71%	18%
Fresno	-	16%	63%	21%	-	16%	62%	22%
Kern	-	19%	53%	28%	-	19%	52%	28%
Kings	-	-	78%	22%	-	-	78%	22%
Tulare	-	-	80%	20%	-	-	80%	20%
South Central Valley*	-	14%	63%	23%	-	13%	63%	24%
Los Angeles	-	15%	70%	15%	-	15%	69%	16%
Orange	-	-	76%	24%	-	-	75%	25%
Riverside	-	10%	76%	13%	-	10%	76%	14%
San Bernardino	-	8%	86%	6%	-	8%	86%	6%
San Diego	-	10%	66%	23%	-	10%	66%	24%
Southern California*	-	9%	72%	18%	-	9%	72%	19%
Influence Area Totals	-	**12%**	**70%**	**18%**	-	**11%**	**70%**	**19%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table J.1 Employment Allocation by Subregion (continued)
Year 2020

County	Percentage of Total County Employment by Subregion							
	HST (base alignment) – Market Trends				HST (base alignment) – Land Use Sensitivity			
	Station Area	Downtown Area	Infill Area	Other Area	Station Area	Downtown Area	Infill Area	Other Area
Alameda	-	-	84%	16%	-	-	84%	16%
Contra Costa	-	-	76%	24%	-	-	76%	24%
San Francisco	57%	-	29%	15%	57%	-	29%	15%
San Mateo	22%	-	62%	16%	25%	-	62%	13%
Santa Clara	11%	12%	59%	18%	12%	11%	59%	18%
Solano	-	-	75%	25%	-	-	75%	25%
Bay Area*	16%	4%	62%	18%	17%	4%	62%	17%
Madera	-	-	82%	18%	-	-	82%	18%
Merced	50%	-	49%	1%	56%	-	43%	1%
Sacramento	10%	14%	59%	18%	12%	13%	59%	16%
San Joaquin	17%	-	69%	14%	17%	-	69%	14%
Stanislaus	26%	-	47%	27%	26%	-	47%	27%
Yolo	19%	-	68%	13%	20%	-	68%	12%
North Central Valley*	16%	7%	60%	17%	18%	6%	60%	16%
Fresno	7%	14%	57%	23%	7%	14%	57%	22%
Kern	19%	-	52%	28%	20%	-	52%	28%
Kings	-	-	77%	23%	-	-	77%	23%
Tulare	1%	-	80%	19%	2%	-	80%	18%
South Central Valley*	9%	7%	60%	24%	9%	7%	60%	24%
Los Angeles	8%	11%	66%	15%	9%	11%	65%	14%
Orange	-	-	75%	25%	-	-	75%	25%
Riverside	22%	4%	61%	13%	27%	4%	57%	12%
San Bernardino	12%	8%	74%	6%	15%	8%	72%	6%
San Diego	11%	5%	61%	23%	13%	5%	61%	22%
Southern California*	8%	6%	67%	18%	9%	6%	67%	18%
Influence Area Totals	**11%**	**6%**	**65%**	**18%**	**12%**	**6%**	**64%**	**18%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table J.2 Employment Allocation by Subregion
Year 2035

County	Percentage of Total County Employment by Subregion							
	No-Project Alternative				Modal Alternatives			
	Station Area	Downtown Area	Infill Area	Other Area	Station Area	Downtown Area	Infill Area	Other Area
Alameda	-	-	83%	17%	-	-	82%	18%
Contra Costa	-	-	72%	28%	-	-	72%	28%
San Francisco	-	49%	31%	19%	-	49%	31%	20%
San Mateo	-	4%	78%	18%	-	4%	78%	18%
Santa Clara	-	19%	59%	22%	-	19%	58%	23%
Solano	-	-	81%	19%	-	-	78%	22%
Bay Area*	-	15%	64%	21%	-	15%	64%	21%
Madera	-	-	52%	48%	-	-	51%	49%
Merced	-	-	72%	28%	-	-	72%	28%
Sacramento	-	23%	54%	23%	-	23%	54%	24%
San Joaquin	-	-	73%	27%	-	-	73%	27%
Stanislaus	-	-	55%	45%	-	-	54%	46%
Yolo	-	-	66%	34%	-	-	66%	34%
North Central Valley*	-	10%	60%	30%	-	10%	60%	30%
Fresno	-	14%	58%	28%	-	14%	57%	29%
Kern	-	17%	47%	36%	-	16%	46%	38%
Kings	-	-	70%	30%	-	-	70%	30%
Tulare	-	-	71%	29%	-	-	71%	29%
South Central Valley*	-	12%	57%	31%	-	12%	56%	32%
Los Angeles	-	14%	64%	22%	-	14%	64%	22%
Orange	-	-	72%	28%	-	-	72%	28%
Riverside	-	9%	77%	14%	-	9%	77%	14%
San Bernardino	-	7%	88%	5%	-	7%	88%	5%
San Diego	-	10%	63%	27%	-	10%	62%	28%
Southern California*	-	9%	69%	23%	-	9%	68%	23%
Influence Area Totals	-	**11%**	**66%**	**24%**	-	**11%**	**65%**	**24%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table J.2 Employment Allocation by Subregion (continued)
Year 2035

County	Percentage of Total County Employment by Subregion							
	HST (base alignment) – Market Trends				HST (base alignment) – Land Use Sensitivity			
	Station Area	Downtown Area	Infill Area	Other Area	Station Area	Downtown Area	Infill Area	Other Area
Alameda	-	-	82%	18%	-	-	82%	18%
Contra Costa	-	-	72%	28%	-	-	72%	28%
San Francisco	53%	-	27%	20%	54%	-	27%	19%
San Mateo	25%	-	58%	18%	29%	-	58%	14%
Santa Clara	13%	11%	55%	21%	19%	10%	54%	16%
Solano	-	-	74%	26%	-	-	74%	26%
Bay Area*	17%	4%	59%	21%	19%	3%	59%	18%
Madera	-	-	51%	49%	-	-	51%	49%
Merced	40%	-	33%	27%	44%	-	29%	27%
Sacramento	13%	12%	52%	23%	19%	12%	52%	17%
San Joaquin	13%	-	61%	26%	14%	-	60%	26%
Stanislaus	21%	-	36%	43%	21%	-	36%	43%
Yolo	20%	-	55%	25%	22%	-	55%	23%
North Central Valley*	16%	6%	50%	29%	20%	5%	49%	26%
Fresno	6%	12%	53%	29%	6%	12%	53%	29%
Kern	18%	-	44%	38%	21%	-	44%	35%
Kings	-	-	69%	31%	-	-	69%	31%
Tulare	2%	-	71%	27%	7%	-	71%	23%
South Central Valley*	9%	6%	54%	31%	10%	6%	54%	30%
Los Angeles	10%	10%	59%	20%	12%	10%	58%	20%
Orange	-	-	72%	28%	-	-	72%	28%
Riverside	27%	4%	57%	13%	32%	4%	52%	12%
San Bernardino	13%	7%	75%	5%	17%	7%	71%	5%
San Diego	13%	4%	58%	25%	19%	4%	55%	21%
Southern California*	10%	6%	63%	22%	13%	6%	61%	20%
Influence Area Totals	**12%**	**5%**	**60%**	**23%**	**15%**	**5%**	**59%**	**21%**

Source: Cambridge Systematics, Inc., 2003.

* Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Appendix K

Land Consumption Allocation by Employment and Residential Components

Appendix K. Land Consumption Allocation by Employment and Residential Components

Table K.1 Increase in Size of Urbanized Areas for Residential Land Uses (Acres) – Year 2002 to 2020

County	No-Project	Modal	HST Base	HST Design Options				
				Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	11,978	12,246	12,619	12,457	12,596	12,619	12,603	12,619
Contra Costa	8,422	8,548	8,740	8,672	8,670	8,740	8,732	8,740
San Francisco	–	–	–	–	–	–	–	–
San Mateo	2,075	2,164	2,221	2,211	2,213	2,221	2,214	2,221
Santa Clara	8,227	8,352	9,745	9,543	9,722	9,745	9,698	9,745
Solano	12,038	12,111	12,240	12,230	12,240	12,240	12,231	12,240
Bay Area*	42,740	43,420	45,565	45,113	45,440	45,565	45,478	45,565
Madera	12,046	12,061	11,845	11,845	11,850	11,845	11,845	11,845
Merced	12,021	12,055	13,343	13,338	13,348	13,343	13,341	13,343
Sacramento	20,991	21,073	20,236	20,219	20,244	20,236	20,236	20,236
San Joaquin	28,056	28,228	26,899	26,923	26,909	26,899	26,896	26,899
Stanislaus	9,242	9,265	9,486	9,009	9,468	9,486	9,018	9,486
Yolo	4,641	4,649	4,607	4,604	4,607	4,607	4,607	4,607
North Central Valley*	86,998	87,331	86,416	85,937	86,426	86,416	85,943	86,416
Fresno	22,049	22,511	21,409	21,402	21,409	21,409	21,386	21,409
Kern	48,169	48,310	53,885	53,883	53,885	53,885	53,839	53,885
Kings	6,694	6,719	7,136	7,136	7,136	7,136	7,133	7,136
Tulare	20,798	20,819	21,067	21,054	21,067	21,067	21,064	21,067
South Central Valley*	97,711	98,359	103,498	103,474	103,498	103,498	103,422	103,257
Los Angeles	20,934	21,342	20,317	20,299	20,317	20,317	20,293	20,317
Orange	12,384	12,701	11,983	11,971	11,983	11,983	11,997	11,983
Riverside	125,413	125,859	120,782	120,759	120,777	120,782	120,760	120,782
San Bernardino	124,015	124,495	127,335	127,055	127,329	127,335	127,310	127,335
San Diego	70,627	72,387	70,751	70,668	70,734	70,751	70,652	70,751
Southern California*	353,374	356,784	351,168	350,752	351,141	351,168	351,012	351,168
Influence Area Totals"	**580,824**	**585,894**	**586,646**	**585,277**	**586,505**	**586,646**	**585,855**	**586,406**

Source: Cambridge Systematics, Inc., 2003.
*Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table K.2 Increase in Size of Urbanized Areas for Employment Land Uses (Acres) – Year 2002 to 2020

				HST Design Options				
County	**No-Project**	**Modal**	**HST Base**	**Palmdale**	**Diablo Direct**	**East Bay**	**Irvine**	**Outlying Stations**
Alameda	9,009	9,308	9,428	9,407	9,438	8,852	9,434	9,428
Contra Costa	6,138	6,348	6,467	6,452	6,466	6,467	6,472	6,467
San Francisco	3,414	3,546	3,762	3,747	3,762	3,756	3,759	3,762
San Mateo	4,410	4,591	5,133	5,119	5,129	5,122	5,121	5,133
Santa Clara	9,798	9,982	9,524	9,509	8,815	9,526	9,522	9,524
Solano	492	734	957	937	956	957	958	957
Bay Area*	33,260	34,509	35,271	35,172	34,567	34,680	35,266	35,271
Madera	240	244	254	254	255	254	254	254
Merced	–	–	–	–	–	–	–	–
Sacramento	3,274	3,368	3,711	3,706	3,716	3,711	3,718	3,711
San Joaquin	16,422	17,072	13,555	13,605	13,562	13,555	13,551	13,555
Stanislaus	6,393	6,550	4,700	4,695	4,695	4,700	4,696	5,796
Yolo	847	855	382	381	382	382	383	382
North Central Valley*	27,175	28,089	22,603	22,641	22,612	22,603	22,602	23,699
Fresno	19,119	20,119	20,960	20,930	20,944	20,960	20,946	20,960
Kern	8,236	8,399	8,557	8,562	8,564	8,557	8,556	8,290
Kings	458	472	484	484	484	484	484	484
Tulare	2,281	2,308	2,223	2,209	2,222	2,223	2,222	2,149
South Central Valley*	30,095	31,297	32,224	32,185	32,215	32,224	32,209	31,885
Los Angeles	24,647	25,803	23,728	23,765	23,711	23,728	24,184	23,728
Orange	30,405	31,307	31,143	31,106	31,132	31,143	30,403	31,143
Riverside	8,828	9,071	8,630	8,617	8,627	8,630	8,622	8,630
San Bernardino	2,528	2,580	2,485	2,482	2,484	2,485	2,483	2,485
San Diego	26,496	27,610	26,832	26,787	26,814	26,832	26,792	35,487
Southern California*	92,904	96,371	92,818	92,757	92,768	92,818	92,483	101,472
Influence Area Totals	**183,434**	**190,266**	**182,916**	**182,755**	**182,161**	**182,325**	**182,560**	**192,327**

Source: Cambridge Systematics, Inc., 2003.
*Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.

Table K.3 Increase in Size of Urbanized Areas for Residential Land Uses (Acres) – Year 2002 to 2035

County	No-Project	Modal	HST Base	HST Design Options				
				Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	19,383	19,979	20,596	20,405	20,628	20,596	20,622	20,596
Contra Costa	13,475	13,837	14,323	14,260	14,331	14,323	14,350	14,323
San Francisco	–	–	–	–	–	–	–	–
San Mateo	4,026	4,222	4,479	4,452	4,472	4,479	4,483	4,479
Santa Clara	35,154	36,262	39,369	38,376	39,085	39,369	39,468	39,369
Solano	20,779	21,091	21,551	21,484	21,555	21,551	21,583	21,551
Bay Area*	92,816	95,392	100,318	98,978	100,071	100,318	100,506	100,318
Madera	23,253	23,364	21,589	21,582	21,604	21,589	21,588	21,589
Merced	24,252	24,530	25,500	25,488	25,519	25,500	25,501	25,500
Sacramento	36,039	36,871	40,325	39,701	39,834	40,325	40,407	40,325
San Joaquin	51,978	53,389	50,155	50,341	50,190	50,155	50,159	50,155
Stanislaus	33,031	33,678	31,785	31,695	31,273	31,785	31,694	31,700
Yolo	10,481	10,595	10,298	10,286	10,298	10,298	10,305	10,298
North Central Valley*	179,035	182,428	179,652	179,094	178,719	179,652	179,654	179,567
Fresno	59,221	60,217	59,197	59,157	59,194	59,197	59,208	59,197
Kern	98,137	98,702	103,067	103,067	103,067	103,067	103,056	105,021
Kings	13,367	13,409	14,640	14,640	14,640	14,640	14,643	14,640
Tulare	45,229	45,295	45,309	44,205	45,309	45,309	45,310	44,368
South Central Valley*	215,953	217,624	222,214	221,070	222,211	222,214	222,218	222,789
Los Angeles	80,429	86,075	87,431	87,277	87,407	87,431	87,365	87,431
Orange	18,962	18,194	16,785	16,760	16,785	16,785	16,893	16,785
Riverside	250,186	282,888	274,624	274,556	274,614	274,624	274,607	274,624
San Bernardino	256,204	257,498	257,614	257,486	257,600	257,614	257,589	257,614
San Diego	136,894	142,303	138,651	137,778	138,615	138,651	138,526	138,651
Southern California*	742,675	786,958	775,104	773,857	775,020	775,104	774,980	775,104
Influence Area Totals	**1,230,479**	**1,282,402**	**1,277,289**	**1,272,998**	**1,276,020**	**1,277,289**	**1,277,357**	**1,277,779**

Source: Cambridge Systematics, Inc., 2003.

Table K.4 Increase in Size of Urbanized Areas for Employment Land Uses (Acres) – Year 2002 to 2035

County				HST Design Options				
	No-Project	Modal	HST Base	Palmdale	Diablo Direct	East Bay	Irvine	Outlying Stations
Alameda	9,904	10,235	10,381	10,357	10,392	9,408	10,391	10,381
Contra Costa	7,675	7,912	8,085	8,066	8,085	8,085	8,100	8,085
San Francisco	4,644	4,804	5,068	5,050	5,069	5,062	5,067	5,068
San Mateo	5,623	5,839	5,919	5,901	5,915	5,908	5,908	5,919
Santa Clara	12,532	12,858	11,554	11,535	10,840	11,556	11,555	11,554
Solano	585	942	1,326	1,294	1,328	1,326	1,343	1,326
Bay Area*	40,963	42,591	42,332	42,203	41,628	41,344	42,363	42,332
Madera	417	428	486	486	501	486	489	486
Merced	–	–	–	–	–	–	–	–
Sacramento	4,702	4,848	5,045	5,039	5,056	5,045	5,058	5,045
San Joaquin	16,422	17,072	13,555	13,605	13,562	13,555	13,551	13,555
Stanislaus	8,537	8,863	6,351	6,331	6,334	6,351	6,335	7,447
Yolo	1,051	1,064	382	381	382	382	383	382
North Central Valley*	31,129	32,276	25,819	25,843	25,835	25,819	25,816	26,915
Fresno	30,710	32,447	33,329	33,267	33,295	33,329	33,316	33,329
Kern	11,425	12,236	12,315	12,327	12,331	12,315	12,326	12,065
Kings	730	767	791	789	789	791	789	791
Tulare	4,192	4,241	3,876	3,853	3,875	3,876	3,875	3,288
South Central Valley*	47,057	49,692	50,311	50,236	50,290	50,311	50,306	49,559
Los Angeles	38,906	40,527	32,631	32,774	32,621	32,631	33,846	32,631
Orange	35,594	36,888	36,682	36,665	36,677	36,682	33,134	36,682
Riverside	10,706	11,045	9,962	9,956	9,961	9,962	9,958	9,962
San Bernardino	2,528	2,580	2,485	2,482	2,484	2,485	2,483	2,485
San Diego	32,811	35,084	31,079	31,050	31,067	31,079	31,052	42,586
Southern California*	120,545	126,124	112,839	112,926	112,809	112,839	110,473	124,346
Influence Area Totals	**239,693**	**250,682**	**231,301**	**231,208**	**230,562**	**230,314**	**228,958**	**243,153**

Source: Cambridge Systematics, Inc., 2003.
*Only includes counties within a region that have a high-speed train station with the HST Alternative, or highway or aviation improvements within the Modal Alternative.